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Suggestions from industry representatives concerning possible topics for future issues are welcomed and should be forwarded to the Editor at the address shown below.

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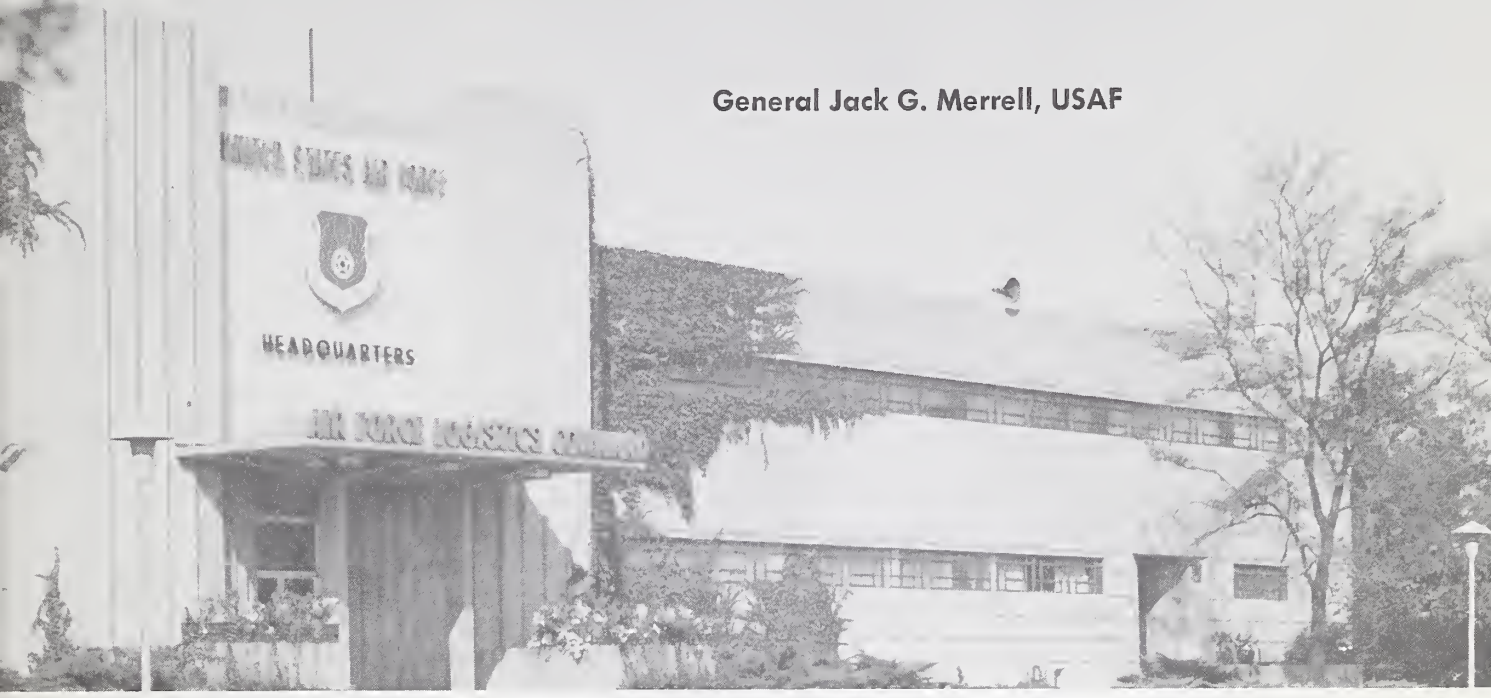
DEPARTMENTS

Materiel movement joined the jet age on a practical scale with the advent of the C–141 jet freighter shown on this month's cover. World-wide movement of materiel is just one of the functions of the Air Force Logistics Command, whose story is featured in this issue.

Effective Logistic Support—Key to Air Force Operational Readiness

General Jack G. Merrell, USAF



Keeping the Air Force's weapon systems at constant readiness anywhere in the world is the mission of the Air Force Logistics Command (AFLC). This mission—which is constantly growing in size and complexity—must be accomplished at the lowest possible cost to the taxpayer. In carrying out its responsibility, AFLC works closely with the Air Force operational commands to assure they have the logistics needed to keep their aircraft, missiles and support equipment constantly at top efficiency.

The four main activities of AFLC are procurement, supply, depot maintenance and transportation:

- **Procurement** is the portion of the logistics process concerned with buying spare items, spare parts, aerospace ground equipment and related items, including requirements for maintenance, modification and technical services.
- **Supply** is the nucleus of logistics. Supply management techniques are tailored to fit the nature of groups of items in the Air Force inventory. An important supply function is the cataloging of some 1.7 million items used by the Air Force. Determining the quantity of items required to support the Air Force also is a supply function. This determining of needs, or computing Air Force requirements, has often been called the "heart of logistics."
- **Maintenance** accounts for the work of 100,000 persons, about half of whom are offbase contract personnel, who see to it that equipment performs its intended function. Information is constantly collected to improve operations and reduce costs. The basic philosophy is to minimize the need for maintenance through improved reliability, and to provide top performance at the least cost.
- **Transportation** is responsible for world-wide movement of Air Force material. This includes storage, warehousing, preservation and packaging of Air Force property, management of materials handling equipment, and operation of the Logistics Airlift System (LOGAIR) which provides airlift support to Air Force bases in the continental United States.

Organization and Operation Functions

Command headquarters of AFLC is located at Wright-Patterson AFB, Ohio. The big industrial-type logistics centers which carry out most of the command's operational functions are known as air materiel areas (AMAs). There are five of them—all in the United States.

Before the late 1950s, AFLC depended on its U.S.-based installations and a selected number of overseas depots to provide support to widely deployed Air Force units. This required lengthy pipelines, stretching from manufacturers through AFLC's stateside installations to the overseas depots and, finally, to the operational units.

Within the last decade AFLC has refined its logistics concept as well as its operations. The Air Force today is geared for instant retaliation. It must be prepared to strike decisive blows with what is already on hand if hostilities begin. The logistics concept today is direct support. The day of costly stockpiling in vulnerable

overseas depots has ended. Direct support means high-speed movement from the United States of priority and high-value materials. It requires almost instantaneous communications and electronic data processing. Today an Air Force activity requisitions and receives directly from AFLC's AMAs whatever Air Force items it needs, regardless of its location in the world.

Every weapon system in the Air Force inventory—and there are more than 300 types—has a "home" AMA. Each AMA has responsibility for the world-wide logistics management of the weapon systems assigned to it for which it provides a system manager. San Antonio AMA in Texas, for example, provides the system manager for the giant C–5A transport. This means that whenever the C–5A will need a replacement part—no matter in what part of the world—the organizational unit will call upon San Antonio and get immediate service by cargo aircraft delivery. If in need of major repair or overhaul, the C–5A will be flown to San Antonio's maintenance shops. Ogden AMA in Utah has the same responsibilities for the Minuteman missile, while Warner Robins AMA in Georgia is the logistics home for the C–141 and many other cargo aircraft.

The key operational activities in the AFLC organizational structure and their responsibilities are:

• **Oklahoma City AMA (OCAMA), Tinker AFB, Okla.,** manages repairs and furnishes spare parts for the B–52, B–47, C/KC–135 and certain other aircraft, as well as a number of aircraft engines and airborne missiles. OCAMA also provides a system manager for a number of ground communications-electronics systems.

• **Ogden AMA (OOAMA), Hill AFB, Utah,** takes logistics care of the Titan II, Titan III, and the solid-fueled Minuteman missiles. It performs logistic management of the versatile F–4 aircraft and the F–101 Voodoo supersonic fighter. Ogden AMA also manages the logistics of the Air Force air munitions program.

• **San Antonio AMA (SAAMA), Kelly AFB, Tex.,** manages 63 percent of the Air Force's total engine inventory, comprising nearly 40,000 separate engines. Its aircraft responsibilities include the F–102 and F–106 fighter-interceptors, the supersonic B–58 Hustler bomber, and the C–5A, now in the flight-test stage. SAAMA also manages logistic support of Air Force reentry vehicles.

• **Sacramento AMA (SMAMA), McClellan AFB, Calif.,** manages the logistics support for all Air Force satellites and satellite tracking systems. In addition, it is responsible for the new F–111A variable-sweep wing fighter, as well as the F–100, F–104, F–105, F–84, F–86, T–28, A–1, T–6 and EC–121 aircraft, and is also the repair activity on the F–106 fighter-interceptor. The Air Force's ground power generator program is SMAMA's responsibility, as is systems support for SAGE and BMEWS equipment.

• **Warner Robins AMA (WRAMA), Robins AFB, Ga.,** has responsibility for logistics management of most of the Air Force's transport aircraft. Included are the C–140 and C–141 jet transports, C–130 and C–133 turboprop transports, and the C–46, C/AC–47, C–118, C–119, C–123 and C–124. WRAMA has similar responsibilities for the B–57, B–66, eight types of utility aircraft, 13 types of helicopters, and the X–142 and X–19 experimental VTOL aircraft, as well as the Mace missile and the Firebee target drone. Other responsibilities include bomb, navigation and fire control systems, airborne communications equipment, vehicles and components, and a number of other equipment classes.

• **The Ground Electronics Engineering Installation Agency (GEEIA), headquartered at Griffiss AFB, N.Y.,** provides single-point management for the engineering, installation and maintenance of Air Force ground communication-electronic equipment, including radio, radar, teletype and telephone systems. About 12,000 people, mostly military, make up 14 squadrons operating in five regions located throughout the world.

• **The Aerospace Guidance and Metrology Center (AGMC), located at Newark AFS, Ohio,** is the single point within the Air Force for the repair and calibration of inertial guidance systems. The center provides direct support to the Minuteman and Titan missile systems. The navigational system support for the F–4 aircraft is also provided by AGMC.

• **The DOD Military Aircraft Storage and Disposition Center, Davis-Monthan AFB, Ariz.,** is under the executive direction of AFLC. The center stores, reclaims and redistributes inactive aircraft for all three Military Services.

• **The Advanced Logistics Systems Center (ALSC), Wright-Patterson AFB, Ohio,** is charged with developing a "21st Century Logistics System," and implementing it in the early 1970s. Using third generation computers, advanced communications, and new techniques in the management sciences, ALSC is expected to produce new concepts and procedures in Air Force logistics.

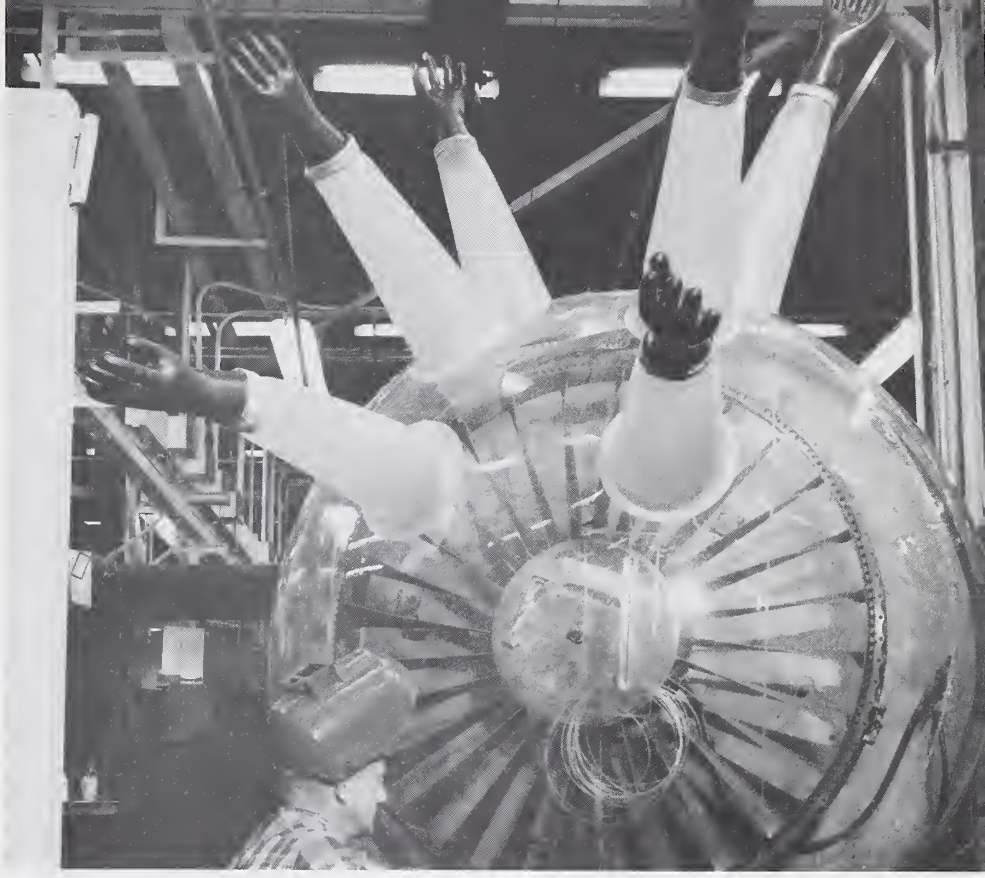
• **Air Procurement Region, European (APRE) and Air Procurement Region, Far East (APRFE)** are overseas extensions of AFLC to accomplish offshore logistics procurement in their respective areas. They are primarily concerned with modification/inspection and repair as necessary (IRAN) procurements, as well as contractor crash and battle damage repairs in the overseas theaters.

In addition to the foregoing organizations, AFLC is in the process of establishing a new organization to be known as the Air Force Contract Maintenance Center. The center

General Jack G. Merrell, USAF, is Commander of the Air Force Logistics Command, with responsibility for keeping Air Force weapon systems operationally ready. Prior to assuming this command, General Merrell was the Comptroller of the Air Force, and before that served as Director of Budget in Headquarters, U. S. Air Force. He is a graduate of the U. S. Military Academy, class of 1939.

will be responsible for administration of contracts at industrial plants located primarily in the southeastern United States. The Defense Department assigned contract management responsibility for these plants to AFLC because of the predominance of Air Force contracts in that area resulting from logistic support needs. Government contracts in the facilities include depot-type maintenance on Special Air Mission (SAM) aircraft, as well as modification and overhaul work on about one-fourth of the first-line fighter and cargo aircraft in the Air Force operational inventory.

Headquarters for the center will be located at Wright-Patterson AFB. The new center will be staffed by military and civilian personnel with specialized experience in contract administration, property management, production, flight test, and quality control. The headquarters staff will supervise the operations of field detachments which will perform contract management functions at various contractor plant sites. The new center, to become operational in September 1969, will assume the contract management responsibilities formerly accomplished by AFLC AMAs.



Filled with inert gas, this eight-arm plastic bag is used by the AFLC's Oklahoma City Air Materiel Area, Tinker AFB, Okla., to repair titanium jet engine inlet guide vanes.

Scope of the Logistics Business

The logistics business is one of the most vital, sophisticated, massive, and important businesses in the Air Force. It touches every aspect of the Air Force. It involves billions of dollars and it has become, since World War II, one of our most complicated and essential professions.

For example, the financial program for AFLC logistics totaled $8.4 billion in FY 1968. Approximately 9,000 aircraft were repaired and about 14,000 engines were overhauled. Component and accessory repair amounted to 2.8 million units. More than 15 million "retail demands" were received from AFLC customers. This, of course, considerably oversimplifies the millions of actions that are taken in the five AMAs and four specialized activities of AFLC, but it does give a frame of reference as to the scope of AFLC's operation.

Obviously it is impractical to describe everything that AFLC does, so this article will cover only some of the highlights. First, where have we been and how did we get here from there? Then, we will review the logistics performance in Southeast Asia, some of the lessons learned there, and how we are making use of them. Finally, some of our plans for the future will be discussed.

Description of where we have been needs only the recollection of World War II and its story of mass logistics. We moved supplies overseas by the hundreds and thousands of tons. The more supplies we got over there the more difficult it became to keep track of them. We could not even count a lot of it. We did not know what was in some of the boxes. That is the story—in over-simplified form—of what happened. This is the kind of logistics the Air Force has been striving to get away from ever since World War II.

At the end of World War II, and for a period thereafter, we had a great many depots in the United States and overseas. We recognized that the materiel in those depots and in the pipeline represented a potential savings of great magnitude, if we could supply overseas units from installations in the continental United States. Increased airlift capability, improved high-speed communications facilities, and the conversion of manual supply systems to automatic data processing equipment made it possible to begin the phase-out of many depots in the United States and overseas in the mid-1950s. By the end of the decade, all overseas depots had been closed.

Even in the United States, a number of installations have been phased out and the phase-out of the Mobile AMA reduces AFLC's operational acivities to five air materiel areas and four specialized activities.

During the past 10 years, the dollar value of the operating fleet has gradually increased, from $20 billion in 1958 to $31.2 billion in 1968. Today's weapon systems—more efficient than their predecessors—are also much more complex and much more costly. This change created the need for more sophisticated spare items and test equipment.

Although aircraft and missile value has increased by 50 percent, the supporting spare parts inventory value in 1968 was $12.2 billion compared to $12.7 billion in 1958.

Ten years ago there was 64 cents in spares supporting each dollar's worth of operating aircraft or missile. Today, only 39 cents is needed, and yet our weapon systems are ready

A SAC B–52, just returned from action in Southeast Asia, is given a routine periodic IRAN check at the AFLC's San Antonio Air Materiel Area, Kelly AFB, Tex.

to perform their mission a much greater percentage of the time—79 percent compared with 65 percent 10 years ago.

How has this been achieved? Major factors have been improved communications, improved computer systems at the bases and the depots, and greater accuracy in inventories and in world-wide responsiveness.

During the same period, as weapon systems became more complex, the number of line items in inventory increased to a high mark of more than 2 million items at the start of the 1960s. Since then, although more complex systems have been introduced into the inventory, a highly concentrated effort to purge old items has been in effect, resulting in a reduction in the number of line items to about 1.7 million at the present time.

Early in the 1960s, the Defense Supply Agency (DSA) was created to increase efficiency of, and reduce the cost of managing, common military supply items and logistic services by eliminating overlapping and duplicating organizations, systems and procedures of the Military Services. About 800,000 Air Force common items have been turned over to DSA, leaving the Air Force with about 900,000 items for which AFLC has sole management responsibility. Basically, the Air Force has retained for management the complex items, the technical items that require specialized engineering support to manage.

Logistic Performance in Southeast Asia and Lessons Learned

The best measure of Air Force logistic performance in Southeast Asia is the fact that our units there are flying two or three times their normal flying-hour program under tough circumstances, and doing it successfully. Not-operationally-ready-supply rates are lower than ever before in the history of the Air Force.

A point to consider is that AFLC has a professional force of logisticians. The day has long since gone when you could take a new second lieutenant, put him out with the supply sergeant and have him learn the business in a few weeks. Today's logistic operation is a sophisticated and highly specialized business, and the people involved must know what they are doing.

Despite the necessary emphasis on Southeast Asia, the logisticians' professionalism has enabled AFLC to increase the effectiveness of its support for Air Force units world-wide. Aircraft, missiles and equipment during this period—wherever located—have been maintained at the highest level of operational readiness.

Lesson One—Maintaining Production Base for Munitions.

Now some of the logistics lessons that have been learned in Southeast Asia.

First, the Air Force, in the early 1960s, had some problems to solve in making the conversion from the strategy of massive retaliation to that of controlled or selective response. Those problems had not been solved when the Southeast Asia buildup occurred. The problem can best be illustrated by discussing the munitions situation.

At the beginning of operations in Southeast Asia, approximately 300,000 tons of conventional munitions were in storage but there was a very small production base. Suddenly we found ourselves in a conventional war and things had to start moving, including production of munitions. Fortunately, the Army and the Navy had saved some tooling and it was possible to reactivate production rather quickly. Production began to exceed consumption in the spring and summer of 1966. Inventories got pretty low, but were never actually exhausted. Some component shortages were experienced at individual bases, such as arming wires, fins and fuzes. Our shortage, technically, was a distribution shortage.

At present the production position

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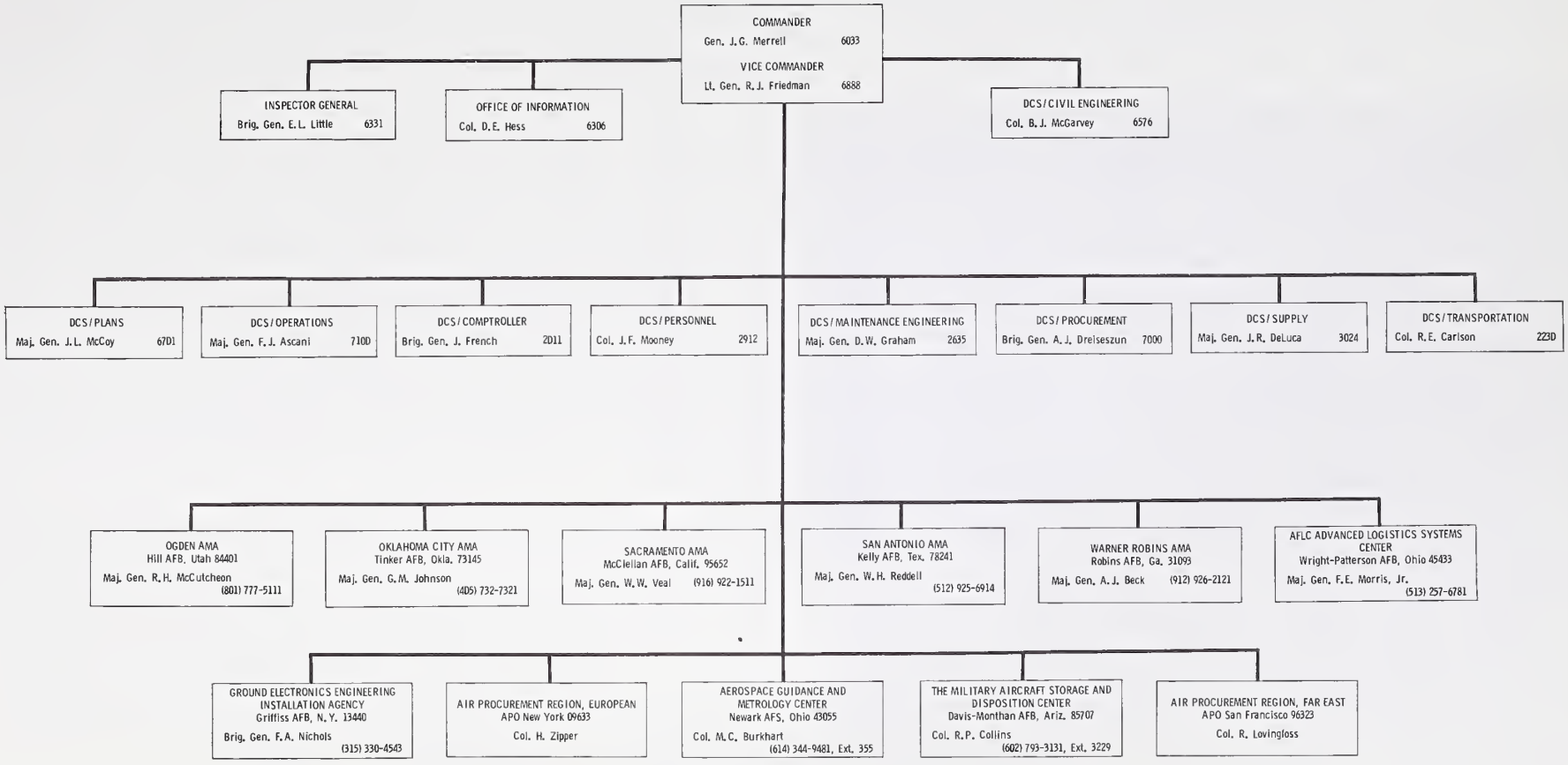
Editor's Note: Organization charts appearing in the Bulletin are edited by the editorial staff to reflect those elements of the various DOD organizations which are of interest to industry representatives. Organizational elements not involved in the DOD-industry relationship have been eliminated because of space limitation.

The information on personnel and telephone numbers is as current as is possible to obtain at the time we go to press.



Automatic handling and conveyor lines at the Oklahoma City Air Materiel Area (OCAMA), Tinker AFB, Okla., warehouses. OCAMA receives approximately 7,000 tons of materiel each month.

is a comfortable one. Even so there were problems in converting from a static system to an active one. Pipeline and inventories had to be controlled to permit movement from the factory, to the storage point, to the shipping point, on board specialized ships, and, finally, in Southeast Asia. Control was necessary at the off-loading point, at the base, on the base to the airplane. A lot of learning was needed to achieve smooth operations.

Now our problem is to keep an active production base in the future. That is the first lesson learned. A very good reason for maintaining production as close to consumption as possible is to prevent excesses in munitions after Southeast Asia.

Lesson Two—Maintaining Production Base for Aircraft.

Lesson number two also concerns a production base—for aircraft. When the buildup began in Southeast Asia, there was a very narrow production base. As a matter of fact, there was only one real production line going—the F–4—and that line was shared with the Navy. Fortunately, working with the Navy, the Air Force had taken some preparatory actions with the contractor and some of their suppliers to increase production. A mobilization effort was developed which banked the production line with parts to allow the production rate to be increased as rapidly as possible. Even with these precautionary actions, a period of almost a year and a half was needed to double our aircraft production.

From this experience it is evident that even with a planned production acceleration, the task cannot be achieved quickly. Therefore, in order to be prepared for conventional contingency conflicts, larger tactical air forces—both men and aircraft—are needed. Then, some attrition, between the start of the contingency and the time that production of aircraft and crews can catch up, could be sustained.

Certainly, more aircraft could be bought and put in cold storage for a contingency. That would be very expensive, but it could be done. However, there is no way to put crews in cold storage. The better solution seems to be larger tactical forces. That is lesson number two.

Lesson Three—Need To Provide Instant Runway Capability.

The base situation in Southeast Asia provided lesson number three. At the outset we were confronted with some difficulty in moving our forces within Vietnam, and such bases as Tan Son Nhut, Bien Hoa and Da Nang were crowded. But troop movement was accomplished in a relatively short time and our forces were operational in a matter of days after arrival. However, the main problem arose when existing bases got so crowded that new ones had to be built. It took a year to build new bases, such as Cam Rahn Bay and Tuy Hoa.

The Air Force, tactically, requires a capability to move into not just a bare-base situation in a matter of hours and operate; actually we must be able to move into a "no-base" situation, where only the real estate is available and be able to create a base within a matter of days. This can be done by making full use of our future air logistics capability.

In this regard, a number of projects are being pursued, working with all the agencies involved. For example, in conjunction with the Air Force Systems Command, vertical structures are being developed, which are lightweight, very durable, and can be erected quickly. With the Army, work is in progress on airfield paving materials that will enable creation of a quick runway capability. Time will be drastically compressed by airlifting and air-dropping the equipment required to do the job.

From the standpoint of logistics, these, then, are some of the important lessons we have learned in Southeast Asia. Solving them was not easy, but we did solve them—by application of professional military and civilian talent and the effective use of data processing machinery.

Plans for the Future

Looking ahead, there are several important things to accomplish. First, there is a great need to modernize

our physical plant for the future—as far ahead as the 1980s.

Obviously, it is not a simple matter to see that far ahead. For example, we do not know what kind of weapons we are going to have then. Experience tells us this much. Yet, some of the older weapons may still be around. We do know enough, however, about the technology of the future to predict the kind of physical facilities that will be needed. Accordingly, a master plan in this area is now being developed. This is being done centrally, at AFLC headquarters, with the air materiel areas providing their input.

Improving Logistic Support Responsiveness.

Probably the most important AFLC project for the future is a program to improve logistic support responsiveness. Toward this end, the Advanced Logistics Systems Center has been created at AFLC headquarters, on a command level equal with the air materiel areas.

The center has the job of developing what we think of as a 21st Century logistics system—and the requirement to make this system operational during the early 1970s. To explain our objective in simplified terms, AFLC is a major user of computers. Computers now used by AFLC are second generation equipment, however, limiting the flexibility needed to improve our logistic management. For example, we need immediate access to storage data and real-time processing of transactions. Consequently, we are now looking toward third generation equipment.

Fifteen years of experience with computers provides the command knowledge of some of the difficulties involved in using computers to do a job. Our plan, in the Advanced Logistics Systems Center, is to develop specifications for, to obtain the "third generation" computers required, and to modernize our logistics processes. Through communications that exist today, and through computers that exist at most of our bases throughout the Air Force—properly programmed with software—we have the ability to develop a "closed loop" logistics system for all the items in the Air Force inventory.

The benefits of a "closed loop" system can be described simply. AFLC will have the capability at the item manager level in a depot to punch a button and ask for the condition, status, quantity and location of any single item, at any base, anywhere in the world. Our goal is to get the information on a near real-time basis—a delay of not more than one-half hour.

Achievement of this system will permit better management of Air Force logistics. Losing visibility of assets in the AFLC inventory is one of the major problems today. As long as the depots do not know where all assets are, they are just as unavailable as if they had never been bought.

With immediate access storage and real-time processing, the new equipment will make possible the maintenance of logistics data in what could be called a unified data bank. It will be accessible to Air Force operating units around the world, as well as to AFLC managers. Decisions by the weapon support manager, the buyer, and the maintenance manager will be based on a current single source library of data. Much of the current redundancy will be eliminated.

In a nutshell, attainment of improved visibility of assets, and the ability to respond more promptly and accurately, will better support the Air Force at a lower cost in inventories and operations.

Improvement of Item Repair Program.

Another AFLC program, already in being, is called AFRAMS (Air Force Recoverable Assembly Management System). This program's purpose is to maintain a "closed loop" system on about 77,000 repairable type assets representing about $5 billion worth of spare parts. Through this system, reports from all bases, world-wide, furnish status changes on these items as they occur. This permits the item manager to know, once he has the initial inventory, the status change of each repairable type item, by line item, on a world-wide basis.

With knowledge on where his assets are, he knows how many repairables he has, permitting better programming of repairs at the depot level and control of assets and their redistribution from base to base. This system is still in the early stages, but it represents a definite forward step.

Why do we need a more responsive system with fewer assets and fewer dollar spent? There is always an imperative requirement to reduce the cost of support of the Air Force. Reducing that cost makes possible more Air Force research and development and more urgently needed modernization for the future.

Many of our aircraft are getting very old. Statistics show that at the end of 1968 about 60 percent Air Force aircraft were more than nine years old. Improvement of the rate of modernization of our forces is a vital concern, and a primary reason for seeking ways and means to do a better job at less cost.

Improvement of Reliability of Weapon Systems.

Another area of concern at AFLC is improvement of reliability of the new systems being acquired. Our approach to reliability is in a quantitative sense.

In order to improve older aircraft, we have a program called IROS (Improved Reliability of Operational Systems). We are taking an analytical approach to the weak links in each one of the weapon systems in the inventory, and analyzing the deficient items with a view toward developing a systematic reliability improvement program.

We want to find the items that are causing flight safety problems, those that are causing high maintenance manhours, and high repair hours. With an orderly approach in detecting these deficiencies, we can attain a high order of magnitude improvement of reliability in many of the systems and subsystems that we have.

To illustrate, we have a tire on one aircraft that has been used for some time. Since 1962, through great effort, a contractor working with the Air Force has doubled the life of that tire, *i.e.*, from 5 to 10 landings before wearout. We do not know what the practical top limit is, but we ought to get up to 100 landings on those tires before wearout.

As another example, there has been enough improvement in the state of the art in electronics, in recent years,

to give us much greater life in electronic systems, radios, and other gear than we are now getting. We are being plagued with high failure rates of even 25 hours between failures. We ought to be getting 2,500 hours between failures. Much work is being done on the systems, that will remain in the inventory, to get these failure rates improved. This again will reduce our support cost which of course, is essential. More important it will improve the operational capability of our forces.

Improving Mobility of Forces in the Future.

To improve our support in another area, we have organized in AFLC a division to work with Headquarters, U.S. Air Force, the Tactical Air Command, the Military Airlift Command, and the Air Force Systems Command on the tactical and overall mobility of the Air Force. This division has the goal of substantially improving the mobility of our forces in the future.

A vital factor in improving the mobility of forces is the C–5A and what it is going to do for our capabilities. When we have a full inventory of these aircraft, we will have four times the airlift capability that we now have. C–5A type airplanes will create a revolution in air logistics, and in preparing for it the Air Force has a great deal of work to do.

Another factor is the improvement in capability of the Civil Reserve Air Fleet which will also be modernizing with newer aircraft, such as the Boeing 747 and Airbus type aircraft. That will give us a tremendous increase in airlift capability in any emergency of the future.

As I have said, we must be prepared for this kind of evolution in air logistics. We must also be aware of the reason why we should use this capability in peacetime. One of the great gains to be achieved will be the reduction in airlift cost per-ton-mile. Our costs have been steadily decreasing, with today's direct operating cost of military airlift at less than 10 cents per ton-mile. The capability of the C–5A gives evidence of a direct operating cost at about 4.5 cents per ton-mile. Obviously, when this rate is reached, many more items will be eligible for airlift from a strictly economic point of view. We are studying this now with the Army and the Navy to determine the additional items that can be airlifted.

The Air Force currently moves about 10 percent of its cargo other than liquids, such as fuel, petroleum and lubricants, by air. It is likely that in the 1970s, we will airlift 25 to 30 percent just because it is the economic thing to do. From the standpoint of contingencies, a greatly increased capability to move large forces quickly can be visualized.

Great emphasis must be placed on research and development planning for this effort for the future, in order to take the utmost advantage of our increased airlift capability to provide greater mobility for our forces.

AFLC Procurement Policy

Air Force Logistics Command procurement transactions currently amount to approximately $2.7 billion annually. It is difficult for the man in the street to comprehend the magnitude of defense procurement and its impact on American society. The Mahon Committee, in a report issued on July 18, 1968, commented as follows on this subject:

> **The magnitude of defense procurement and logistics activities and policies are such as to directly affect every state and, directly or indirectly, the vast majority of the American people. In 1967 alone, defense prime contract awards totaled $44.6 billion and encompassed 15.1 million separate procurement actions. Inventories of weapons and equipment in use in this same time frame amounted to $95.5 billion. . . .**

These staggering sums of public money impose a sacred trust and responsibility on all of us who handle them. Every administrative device we can develop and apply is used to assure that the best interests of the nation are protected and served.

The Mahon Committee noted this enormous responsibility in its report:

> **The basic objective of those charged with the administration of a program of this awesome magnitude is to secure prime quality equipment and weapons systems at reasonable costs and in an efficient manner. The most effective way yet demonstrated to achieve this objective is through timely, competitive procurement . . . maximum effort must be made by defense procurement and contracting officials to assure the acquisition of new systems of desired quality at fair and reasonable prices to the government.**

The objective, so clearly outlined in the Mahon report, is the guiding principle behind the procurement policies of AFLC. Our major objective has been, and continues to be, "provide timely support of our operational requirements without sacrificing sound procurement practices and goals." Effective management, both on our part and that of our contractors, is a must. Of course, regard for the public interest must always be our primary concern; nevertheless, we must always assure that fair and equitable practices govern the buyer-seller relationship.

This article has discussed at great length systems, programs, problems, machines, aircraft, and policies, relating to logistics management in the Air Force. The discussion would be incomplete without recognizing an important single resource which outweighs and overshadows everything else. This is people—military and civilian, men and women, in Government and in industry. It is the logisticians in the Air Force and in industry who solved the problems I have discussed and it is their skill that will solve the future problems.

Someday there will be third generation computers and after that a fourth generation. The C–5A system, the Airbus, and the heavy lift helicopter—and only the most imaginative can foresee what is beyond them —will be part and parcel of a vastly complex and uniquely different logistics system from what we have today. We must have sophisticated and highly trained human resources fully prepared to meet that day.

Logistics is our life's blood; without it we cannot live. It is immense, it is complex, and it is vital.

Some Observations on Integrated Logistic Support in the Air Force

Lieutenant Colonel Edward G. Sperry, USAF

A system is a big black box
Of which we can't unlock the lock,
And all we can find out about
Is what goes in and what comes out.
—Boulding

Would you believe that the following quote is an extract from a current Air Force approach to integrated logistic support?

> **". . . it provides a means for developing hardware, facilities, personnel and procedural support information on a concurrent and integrated basis, minimizing oversights in design, optimizing design, reliability and minimizing costs. . . . procurement of vast quantities of hardware which is utimately determined to be unnecessary, and generating requirements for extensive modification programs can be eliminated through implementation of this plan . . ."**

Actually, the words were written in 1960. They are from the Systems Engineering plan for the Minuteman missile system.[1] This article on integrated logistic support (ILS) begins with mention of systems engineering because of the absolute necessity that logistics and engineering disciplines effectively interact. Systems engineering and ILS relate conceptually as is shown in the DOD ILS Planning Guide.[2] For our purposes, description of the relationship can be even further condensed. Specifically, logistic personnel must be able to express their needs to the systems engineering process which must, in turn, be able to define and optimize the total system. ILS personnel must be participants in the process and use the products of systems engineering to insure a common baseline for logistic elements. Perhaps this is belaboring the obvious, but it is essential that ILS not be considered as a separate entity divorced from the other elements of systems management.

This discussion will develop three aspects of ILS. First, we will review the environment concerning policies and procedures which must exist to enable logisticians to express their objectives and effectively participate in acquisition management. Second, we will consider the contributions logisticians have to offer. Finally, some comments about the logistic participant.

ILS Role in System Acquisition Management

To paraphrase Archimedes—the logistician could move the universe if he could find a place to stand. His place to stand is the product of basic policies and procedures of the Air Force. ILS is inherent in the very concept of systems management. In the case of the Minuteman missile we achieved the objectives of ILS. In other cases we have not as quickly achieved the desired degree of support. Therefore, our policies and procedures have been under review.

Headquarters, U.S. Air Force, Air Force Logistics Command (AFLC), Air Force Systems Command (AFSC), and Air Training Command (ATC) have been developing the necessary changes. Two significant decisions have already been implemented. First, during the conceptual phase, AFLC now makes a provisional determination of which air materiel area will support the weapon system. Second, the initial System Program Office (SPO) cadre now includes a deputy system program director for logistics. He will carry the integrated logistic responsibility into contract definition and through acquisition. Recently established program offices, such as the Airborne Warning and Control System (AWACS) and F–15, have this arrangement.

The F–15 has also been subject to a task force for assuring that ILS considerations are covered in the acquisition contract. Lessons learned

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[1] *Space Technology Laboratories, Inc., 6600.33.118, Nov. 18, 1969, "Description of the Minuteman System Engineering Plan."*

[2] *"Integrated Logistics Support Planning Guide for DOD Systems and Equipment," Oct. 15, 1968, is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, for $3.75. Defense contractor managers can obtain copies through their cognizant military contracting offices.*

from the task force will be applied to subsequent systems. Task forces will also be used for a missile and an electronic system in order to ferret out peculiarities.

Staff assessment of ILS implementation requirements, experience from the task groups for specific systems, and experience of the SPO deputies for logistics are all being used to determine how the Air Force should revise its basic regulations and procedures to more adquately implement ILS.

Changes are required in regulations which govern conceptual, contract definition, and acquisition phases. Changes will probably also be required in selected functional regulations pertaining to the various logistic elements. As the basic Air Force regulations change, reaction will be necessary at lower and lower echelons. The policy and procedural overhaul will, therefore, take some time. This may be better understood if we examine the requirements which must be met.

ILS, as delineated in DOD Directive 4100.35, requires integration with other management subsystems that govern hardware design and procurement as well as logistic support. In this context, ILS implementation can be likened to a design task which is subject to design requirements. Foremost is obviously the basic directive which contains the definition of ILS, the need for a single individual responsible for ILS matters, and the relationship of ILS to system/project management. However, design of policies and procedures to meet DOD Directive 4100.35 is constrained by other requirements, many of which are not normally considered as logistic in origin (Figure 1). As an example, specific consideration should be given to the following:

- DOD Instruction 7000.2 which clearly expresses the requirement to use contractor internal management processes, as opposed to imposing government procedures. The contractor processes should be validated against criteria to assure their adequacy.
- DOD Instruction 7000.6 which expresses requirements for control over new or revised contractual management systems.
- DOD Instruction 7000.7 which expresses requirements for control over application of management systems to specific programs; whereas DOD Directive 5010.23 expresses policies requiring flexibility in the selection of tailoring of management systems for any research and development project (including major system acquisitions).
- DOD Directive 5010.14 which establishes the framework of system/project management requiring a single responsible manager for the entire system.

Two other essential ingredients in the requirements mix remain to be identified. They are the flexibility of contract approach, ranging from cost-plus-fixed-fee to fixed-price-incentive; and the variations in the program definition techniques which may be exercised.

At risk of breaking our train of thought, the latter warrants additional explanation. There is growing concern that contract definition paper analyses are not defining contract requirements to the point where cost schedule and performance commitments can be realistically confirmed between the Air Force and industry. There is more and more interest in continuing the definition process through the initial competition of prototypes. Whatever policy and procedural changes the logistician creates, he must accommodate this potential shift. For all its advantages, contract definition, using prototype competition, will cost more than paper analyses. Increased costs may create a temptation to restrict the competition to consideration of only key performance parameters. We must assure that key logistic requirements are among these parameters; otherwise, we will have come full circle and find ourselves, once again, forced into the inefficiencies of accommodating support requirements through engineering changes.

Considering the variations that exist within each of the management requirements described in the foregoing, it becomes apparent that there is no universally applicable way to implement ILS. The program director and his logistic deputy must be provided various means of implementation and authority to select those appropriate for the specific program.

The Air Force encountered the same situation during the development of an approach to systems engineering management. A long line of procedural documents (starting with the systems engineering instructions for Atlas, Titan and Minuteman) finally culminated in Air Force Systems Command Manual 375–5. The manual describes a rationale and process for systems engineering which is essentially the generalization of processes developed during ballistic missile acquisition. Its first application was on the C–5A, a total package procurement program. It was soon recognized that a procedural manual, prescribing definite techniques, formats and in-process approvals, was incompatible with the C–5A's total package procurement concept using a fixed-price-incentive contract.

Accordingly, the Air Force has been developing a military system engineering standard. The standard allows contractors to use their individual management techniques, once these techniques have been validated against prescribed criteria. The standard does not replace the engineering manual. A manual is still required, as are handbooks and validation techniques. Fortunately, the elements addressed by systems engineering are also the elements addressed by ILS. Therefore, development of ILS processes can capitalize upon the several years of effort in developing flexible techniques for systems engineering. Also, the systems engineering standard will be the basis of technical performance measurement of key contractual logistic parameters.

The Logistician's Contribution

To this point, we have seen that the logistic environment is being improved. Success is partially dependent upon continued improvements in systems engineering management and in steps taken to assure that logisticians have flexible techniques commensurate with the varied approaches available to the development community.

Earlier we paraphrased Archimedes concerning a place for the logistician to stand; now let us consider the lever he will use when the scaffold is provided. How does he contribute, bring leverage to bear? He must assist in quantifying the logistic effects of the design process. His procedures must spell out "how" to quantify logistic effects in dollar terms. Yet, the ability to quantify projected support requirements so that the results of design efforts can be evaluated is what is lacking. Without quantification of these effects, false credence is given to minimizing

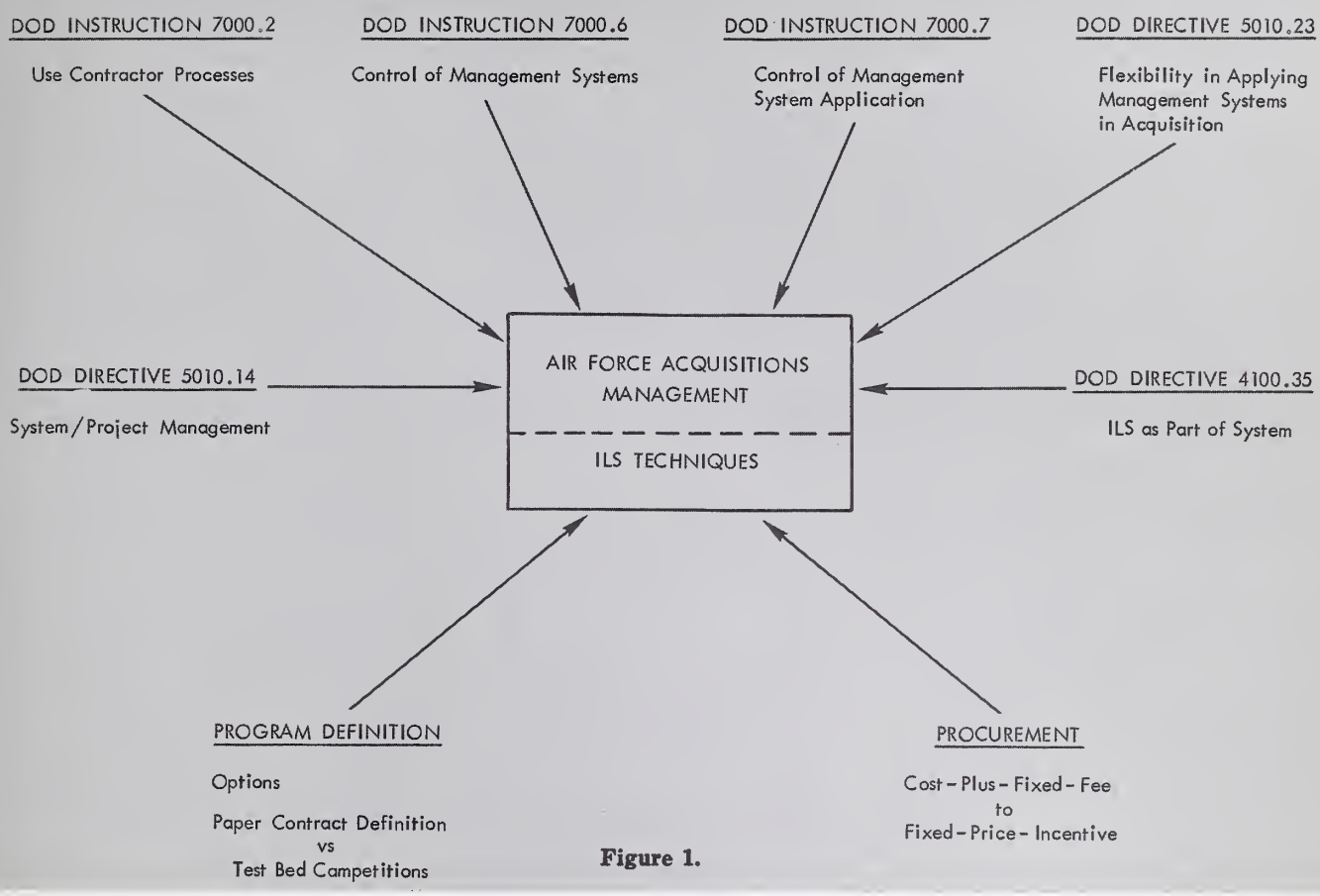

Figure 1.

initial development and acquisition costs.

The inability to properly quantify logistic effects and establish demonstrable contractual goals has resulted in adverse support conditions. In such cases, the users live with low system availability, high repair rates, retraining, and multiple configurations. The logisticians compensate with extra resources for spare parts, repair labor, and hardware modification programs. The resulting expenses create unfavorable publicity and a generally difficult "fishbowl" management climate.

The objectives of ILS will not be achieved until the quantitative aspects of the complex decision processes are more fully developed. In this connection, one recent development by the AFLC offers great potential. It is a project—called Project ABLE—of the Operations Analysis Office of Headquarters, Air Force Logistics Command. The project is being intensively examined in relation to potential applications by the Deputy Chief of Staff for Operations of AFLC headquarters, and is receiving formal assessment within the Air Force Systems Command.

Project ABLE is built upon a concept which is widely voiced, but which has heretofore been honored more by the breach than the observance: that decisions should be based upon *all the consequences* which will ensue. The project now contains specific mathematical formulae for measuring all the logistic consequences, ranging over traditional logistic costs (spares, repairs, test equipment, etc.) and including also such important weapon system characteristics as availability and dependability. The composite is quantified in a figure of merit called Total Logistic Effects. When the project is developed to its full potential, it should also embrace non-logistic consequences, including such capability variables as range, payload, bombing error, etc.

Since the key variables in these logistic formulae will be the result of the contractor's success in reliability and maintainability, Project ABLE calls for each bidder to make his own projection of these total effects. The Government treats each such projection as a contractual target—Target Logistic Effects (TLE). The TLE is considered in conjunction with each bidder's targets for development and acquisition costs, performance capability, and in source selection.

At predetermined stages in the development and production cycles, the contractor will be subjected to specific demonstration and test requirements. When processed through the same ABLE formulae as were used for targets, the test results will yield new estimates of the "total consequences" which are called Measured Logistic Effects (MLE). A comparison of commitments (TLE) and achievements (MLE) then becomes the basis for an incentive program in which the component parts have been so fully integrated that no possibility of imbalance exists.

As the winning bidder faces a myriad of design decisions and maintainability determinations, he can consistently use the MLE formulae as

his basis for tradeoffs. His MLE calculations provide the measure of payoff or benefit, against which he can consider alternative costs. Cost/effective decisions are then feasible. If the incentive program involves a "carrot and stick" combination which is suitably sized to reflect the dimensions of the Total Logistic Effects, there can be little question that the contractor's design personnel will be appropriately instructed to make his decisions on the basis of the MLE. When this happens ILS will be assured, for the decisions which are in the best interest of the contractor will be the very same decisions which are in the best interest of the Government.

From the logistician's point of view, Project ABLE is intended to make new systems better—sooner! From the perspective of the Air Force, the project seeks to facilitate the balance of operations and support. It contributes the quantitative tools which are needed for the tradeoffs that ILS endorses. The Air Force is vigorously involved in assessing and further developing this promising new concept.

Characteristics of the ILS Manager

Finally, what manner of man have we been discussing? Is there such a person as an ILS officer? This question is of concern to the Air Force and is being studied by personnel specialists. We will risk a few comments before the analyses are completed.

The ILS officer's task is management. There is probably no need for a superman who is capable of dealing with each of the logistic elements in depth. No one attempts this today in such multiple discipline areas as engineering, test, procurement and production. He will need the professional maturity to select and tailor whichever ILS management techniques are applicable to the specific program with which he is concerned. His background should probably be technical and analytical with experience in logistics. It will be necessary that his technical background be compatible with the design engineering and test personnel with whom he must deal. Given some experience such a man could be effective in either the AFSC or AFLC portion of a System Program Office. The ideal career development program may include cycling between development, test and logistic management tasks.

The renewed interest in logistics, whether under the banner of ILS or life-cycle costing is having a constructive impact upon Air Force policies, organizations and techniques for systems acquisition. Likewise, the Air Force's leadership in systems engineering, the tailoring of management systems to the contract environment, and in developing new techniques for quantifying logistic effects are major factors in advancing the objectives of ILS. We are becoming more and more capable of carrying out the intent of systems management which was once so succinctly expressed as the "prevention of random, piecemeal, accidental discovery of weapons systems." [3]

[3] *Colonel John Chandler, Feb. 15, 1962, "Acquisition Management Aspects of Weapon Systems Analysis and CIC&A," AFSC Ballistics Systems Division, Inglewood, Calif.*

GE Re-entry Systems First To Meet New USAF Cost Control Program

General Electric Re-entry Systems, Philadelphia, Pa., has become the first aerospace contractor to reach operational achievement of the Air Force Systems Command's Cost/Schedule Planning and Control Specification (C/SPCS), for the company's Minuteman III research and development program.

C/SPCS planning and control specification is an aspect of the AFSC's cost management improvement program, aimed at achieving cohesive Air Force-contractor management control systems. Instead of requiring a specific internal cost and schedule system or method, C/SPCS embodies a set of criteria which outline capabilities the management system must possess to satisfy Air Force requirements. It also encourages contractors to use a system best suited to their own internal needs, within criteria established by the Air Force. This approach is designed to provide early awareness and identification of possible problem areas.

In the past the Government specified particular systems for a contractor's use, which often resulted in the contractor operating one system for reporting to the Government, while using another system in the actual management of the contract.

Army Developing Larger CONEX Units

A larger version of the containerized express container, or CONEX, widely used by the Army to deliver materiel to Vietnam, is under development by the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.

The new CONEX is a corrugated sheet-steel container with a capacity of 13,000 pounds, 4,000 pounds more than the current model. It measures 8 feet long, 6 feet 8 inches wide and 8 feet high and has a volume of 350 cubic feet, compared to the 8 foot, 6 inch-by-6 foot, 3 inch-by-6 foot, 10½ inch older model that had 294 cubic feet in volume.

The improved version also features built-in high strength couplers, permitting three containers to be joined into a 20-foot unit that meets commercial rail, road and water standards. Loaded to its 44,800 pound gross weight it can be lifted by cable sling.

Doors of the new CONEX are crimped and plastic-lined for improved weatherproofing. A second version with the same capacity as the current model is also undergoing development.

Army Seeks Helo Rearming Vehicle

A weapons loading vehicle for the AH–56A Cheyenne helicopter is being sought by the U.S. Army Combat Developments Command (CDC), Fort Belvoir, Va., to provide rearming for the craft when its own hoist system has suffered battle damage or malfunction. Rearming is now being done manually, resulting in both loss of time and increased personnel risk.

The CDC proposal called for modification of the Army's "Mule" to provide it with one-ton hydraulic lift capability, with only a small loss of mobility. The proposal also set a hoist capability of 50 inches from the ground and a fail-safe feature to prevent load drop in case of hydraulic failure.

The loader would be airlifted into a battle area by either cargo aircraft or helicopter, and would provide rearming for Cobra and Huey gunships in addition to the Cheyenne. It would also double as a weapons and stores lifter for other aircraft.

Flexibility in Management of Research and Development

James W. Grodsky

The research and development program of the Defense Department is a very complex, multi-faceted organism made up of thousands of individual projects. The variations from project to project are extremely great, using almost any criterion one can imagine: size, complexity, kind of organization doing the work, degree of technology advancement sought, relationship to inventory use, urgency of operational need, etc. Although the research and development program as a whole has discrete objectives—utility of the end product and efficiency of the process, even the degree to which these objectives are pursued varies substantially from project to project.

Many individuals in the Defense Department have long recognized these substantial variations. However, others have not always been sufficiently flexible in applying management systems and techniques to projects which they control or influence. Newly issued DOD Directive 5010.23, "Flexibility in the Management of Research and Development," Jan. 14, 1969, addresses this problem. The objective of this directive is "to provide an environment in which a project manager is given the opportunity to select and tailor to the specific needs of his project those management systems and techniques that will help his project." This article is a summary of the policy enunciated by the referenced directive, and its rationale.

What Are Management Systems and Techniques?

Management systems include planning systems, control systems, and other systems used to assist managers (both in-house and under contract) to:

- Define or state policy, objectives and requirements.
- Achieve efficient and effective utilization of resources.
- Periodically measure program performance.
- Compare that performance against stated objectives and requirements.
- Take appropriate action.

Management techniques are similar to management systems, but tend to be formal, procedural methods which project managers use to achieve the objectives of their management systems.

The flexibility policy of DOD Directive 5010.23 applies only to those management systems and techniques (hereafter referred to as systems) that are described in a published document (either regulatory or permissive), such as a regulation, directive, instruction, handbook, manual, standard, specification, or similar document. This is limited to published documents since rigidity in management usually results from written rather than oral direction.

What Kinds of Problems Were There?

During the late 1950s and 1960s, numerous project management systems were developed by the Secretary of Defense and the Military Departments. Examples of such systems include contract definition, integrated logistic support, PERT and PERT/cost, systems engineering management, total package procurement, configuration management, and work breakdown structures.

In sum, these made up a "Chest of Management Tools" which could be very useful to a project manager. However, there were three problems:

- Management systems were sometimes applied to a project when they were not appropriate at all.
- They were appropriate, but were applied to a depth or a level of detail that was not appropriate.
- They were applied at the wrong time, *e.g.*, too early in the project's life.

The consequences of such cases of misapplication, particularly if more than one management system was misapplied on one program, could be very serious. There could be substantial increases in cost, project delays, and failure to accomplish the more important project objectives. In such cases, management attention could be diverted from providing answers to more critical project questions, such as: What are the objectives of the project? How can they best be achieved? How can unnecessary project costs be avoided?

To cite an example of misapplication, during the contract definition phase of a major program the systems engineering management procedures were followed at too low a level of detail for this phase of the program. This resulted in generation of a huge mass of paper. Only a small part of this paperwork was really useful in the source selection and program decisions made at the end of

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Relationship Between DOD Directive 5010.23 and DOD Instruction 7000.7

	Directive 5010.23	Instruction 7000.7
Kinds of projects to which applied:	All categories of research and development.	Production and later categories of development (engineering and operational systems development)
Organizations to which applied:	In-house and contractors.	Contractors.
Kind of direction:	Policy—to establish proper environment.	Procedures—to select management control systems.

Figure 1.

contract definition, and in planning the development program that followed. In particular, the detail of logistic-related efforts, which is absolutely necessary at some point in the program's life, was far greater than was necessary at that point in time. The result was unnecessary expense, dilution of the efforts that contributed most to the program at that stage in its life, and camouflage of the useful products.

What Were the Sources of the Problems?

These problems arose from environmental and attitudinal rather than procedural causes. They were a reflection of the total environment surrounding the development process and the attitudes of the people involved, particularly project managers, their staffs, and functional managers and specialists (reliability, systems engineering, configuration management, etc.). The major sources of these problems were:

• **Reliance on Specialists.** Project managers, being generalists, are usually familiar with special management systems only in gross terms, and they frequently must turn to a specialist in a particular management system for advice. The specialist is usually not unbiased. Rather, he is an advocate of the management system in which he is "the expert." This is quite natural and desirable. He has seen the advantages of the management system, hopefully has some real experience in its use, and has faith in its benefits. In some cases, particularly if he is not even on the project manager's staff, his knowledge of the project may be insufficient for him to evaluate the total influence—both good and bad—of the particular management system under consideration. Under these conditions, it is likely that a special management system will be applied to the project, and that the degree of application will err in the direction of too much rather than too little.

• **Attitude of Higher Authority.** A project manager's actions are influenced by what he *thinks* is the attitude of the higher levels of command in his own Department and in the Office of the Secretary of Defense toward a particular management system. All of the evidence that he usually has causes him to believe that they favor application of the particular management system. It is in the form of a written directive, a regulation, or a specification. Sometimes it is permissive, but usually even then it has some mandatory aspects. There may not even be provisions for waivers, in which case the project manager would logically assume that they will not be granted or that, at best, there is an unfavorable climate for them. Even if there is a waiver clause in the regulatory document, he may believe that this is just "window dressing" and the people responsible for deciding on waiver requests are generally unreceptive to them.

• **Inability To Evaluate Effects of Application.** Unless a project manager has had real-life experience with a particular management system which he can translate into anticipated effects on his current project, it is difficult for him to recognize the total impact—both good and bad—that it will have. Even if he does conclude that it will do more harm than good, he has to decide whether it is worth fighting about. He usually has a large number of other important problems in which he is, if not an expert, at least a very knowledgeable layman. He must select those few problems on which he will very often not choose to fight the application of a specific management system to his project, even if he senses that it will not really help him.

• **Decreasing Flexibility at Lower Organizational Levels.** There is a common saying: The farther down you go in an organization, the more rigid the policies and practices become. There is much truth in this. The rationale for a management system, for example, and the nuances of its application tend to evaporate as regulations for that system are passed down from the headquarters level to the command level, and on down to the working level. Without a good understanding of the true objectives of the policy makers, it is only natural that the working troops tend to use management systems whose worth on their projects they question or think is marginal.

• **Reliance on Systems Instead of People.** Several factors have pushed project managers into more and more reliance on managements systems, such as the difficulty in getting the numbers and kinds of people who will be most useful and the recognition that systems can be of help. What is sometimes lost sight of is that management systems are only an aid to people, but not a substitute for them. People are still required to evaluate information, to exercise judgment, and to make decisions.

• **Lack of Clear-cut Decision Authority.** Suppose that the project manager and a specialist on a particular management system disagree on whether that system should be applied, or on the depth of its application. Who makes the decision? In

some organizations this is not clearly the prerogative of the project manager, and disputes must move up the ladder for decision. Then the previously mentioned bugaboo appears. Where should a project manager spend his limited energies? When the project manager does not have the authority to determine application of management systems to his project, misapplication may occur because he feels he cannot afford to fight every problem that arises. It is our belief that when the pros and cons are about equal for application of a specific management system, the project manager's wishes should prevail. This coupling of authority and responsibility is necessary to achieve better performance on our research and development projects.

To sum up, for a variety of reasons, the environment that has existed has encouraged use of management systems even when they were not helpful to a project.

What Did We Do?

Since the basic problem was one of attitude and environment, our goal was not to set up procedures but rather to establish the proper environment—one conducive to selecting and tailoring management systems to the particular needs of each project. In line with this goal, the Deputy Secretary of Defense, in late 1966, approved the so-called "Chest of Management Tools" policy which was provided to the Military Departments in 1967. This formed the basis for DOD Directive 5010.23 which applies to management systems directly related to the needs of a project manager, including those levied by the Office of the Secretary of Defense on the DOD Components (Army, Navy, Air Force and Defense Agencies), higher levels of authority in the DOD Components on their project managers, and DOD Components on their contractors. It applies to all categories of research and development (research through operational systems development) without limitation as to size and scope of the research and development effort. Flexibility is particularly necessary for research and development because of the risks and uncertainties associated with such efforts, and the need for them to take place in an environment that stimulates creativity and ingenuity.

The "Chest of Management Tools" policy:

- Focuses on the project manager.
- Makes clear that only those management systems required by law or the Armed Services Procurement Regulation are mandatory.
- Calls for selective application of all others. Criteria for application are when the management system will "substantially benefit" the individual project, or when there are benefits that extend beyond the project itself.
- Recognizes the need for mechanisms for formal waiver approval from management systems required by regulatory documents.
- Stimulates considering each management system in the light of its total influence (pro and con) on the specific project before applying it.
- Calls for project manager responsibility for overall management of his project, with functional managers in a *recommending but not decision* position.
- Expects project managers to employ management systems that are obviously intended to apply across the complete spectrum of DOD activities, *e.g.*, budgeting systems, security systems, etc.

Relationship to Other DOD Policies and Procedures

The "Chest of Management Tools" policies are closely related and complementary to the policies and procedures of DOD Instruction 7000.7 (The Selection and Application of Management Control Systems in the Acquisition Process). The most important differences between DOD Directive 5010.23 and DOD Instruction 7000.7 are shown in Figure 1.

The focus of the "Chest of Management Tools" policy is on the needs of the individual project manager, in contrast to the broader aims of DOD Instruction 7000.7 and its companion DOD Instruction 7000.6 (The Development of Management Control Systems for Use in the Acquisition Process) which are intended to reduce unnecessary proliferation of management systems in Defense Department. DOD Instruction 7000.6 provides a formal procedure for development of new management control systems or substantial modifications of existing management control systems, and for the inclusion of such systems in a Management Control System List and an Authorized Management Control Systems List. In the near term, only systems on one of these lists can be selected for contractual application. Ultimately, only systems on the Authorized Management Control Systems List can be selected for contractual application and DOD Instruction 7000.7 provides a procedure for selection of management control systems from these lists.

The guidelines, principal considerations and standards of DOD Instruction 7000.7 and the Management Con-

Implementing Regulations of DOD Components

Department of the Army	Army Adjutant General Memorandum AGAM-P(M), March 5, 1969
Department of the Navy	SECNAV Instruction 5220.10
Department of the Air Force	Air Force Regulation 80–30
Defense Communications Agency	DCA Instruction 630–50–3

Note: Contractor representatives who have need for copies of the DOD component implementing documents should place requests through their cognizant DOD contracting agency.

Copies of the DOD Directives and Instructions referred to in this article may be obtained without charge (one copy per requester) from the Naval Forms and Publications Center, Attn: Code 300, 5801 Tabor Ave., Philadelphia, Pa. 19120.

Figure 2.

trol Systems List of DOD Instruction 7000.6 should be useful to the research and development project manager in selecting and tailoring his management systems, but they do not comprise all of the tools for this task.

What People Are Affected?

The greatest impact of the "Chest of Management Tools" policy is on research and development project managers, both those within DOD and those working for DOD under contract. It provides them with a clear signal from the top management of the Defense Department: Take the initiative to do what you think is best for your project. DOD policy and the implementing regulations from the DOD Components (see Figure 2 on page 15) can be used by project managers as the basis for selecting and tailoring the management systems that will help their project. We are hopeful that project managers, both in Government and industry, will actively seek waivers on those management systems, or parts of them, that are inappropriate whether they are promulgated by the Office of the Secretary of Defense or by a DOD Component.

Since the aim of the overall policy is flexibility, it is incongruous to prescribe a single, rigid procedure for obtaining waivers. Therefore, several alternative means are suggested in the policy directive. One means which seems eminently sensible is to use the management plan portion of a development plan as the vehicle for this. Identification of the management systems in the development plan for an individual project, together with identification of those systems for which waiver is required and the reasons for waiver, permits overall review and approval of the management plan without the necessity for waiver of individual management systems.

Management systems and techniques are referenced, and guidance or direction for their use are provided in a very large number of documents within DOD. These documents occur at many different levels: the Office of the Secretary of Defense, the headquarters of the Military Departments, the commands, etc. In order to provide an environment *for the project manager* promoting flexibility in his management, the many documents that he sees and uses must reflect flexibility. Therefore, during the next year or two, these documents must be reviewed and changed to assure that documents that the project manager sees and uses provide a homogenous environment of flexibility.

In order for the "Chest of Management Tools" policy to be successful, the people directly involved in considering the application of a specific management system to a specific project, and those in the chain of command for waiver requests (everyone in the path from the level immediately above the project manager to the authority who will make the waiver decision) must be receptive to the philosophy of flexibility. In addition, of course, the specialist in the particular management system that is being considered can make a unique contribution because of his specialized knowledge.

This amalgamation of the specialist's knowledge in his area of concentration and the overall view of the project manager is necessary to achieve efficient management, tailored to the needs of an individual project. In any program flexibility is desirable. In a research and development project, it is essential because of the inherent uncertainties that are characteristic of research and development, particularly the so-called "unknown unknowns" which become visible only as the work progresses.

When we adopt a flexible attitude toward the application of management systems to each project, we can limit our problems to those dictated by the physical environment. When we adopt an inflexible attitude, we add to these problems others of our own creation. The Secretary of Defense has established the flexible attitude as the official policy, but he needs your assistance to translate the policy into practice. Will you help?

DSA Reports Cases of Laxity in Security Review Procedures

Inadvertent release of classified information in advertising and various publications by Defense Department contractors has been pointed out by the Office of Industrial Security, Defense Supply Agency. The office reported that some contractors are not strictly following the provisions of paragraph 5n of the Industrial Security Manual for Safeguarding Classified Information (Attachment to DD Form 441) and not assuring that their standard practice procedures comply with requirements of the manual.

In one case a contractor furnished his advertising agency two versions of advertising copy. One version had been reviewed and approved by the user agency; the second had not been approved for public release. The advertising agency chose the disapproved version and published it. Contractors are reminded to ensure that required security review is accomplished before information is given to an advertising agency, and that strict attention is paid to the security system to ensure that it works.

In a related case, a contractor published unclassified information concerning classified information in a house organ without having submitted the article for review. Instead, FOR OFFICIAL USE ONLY was printed on the cover. Since distribution of these publications is usually random, the warning was useless. The proper procedure would have been to submit the article for review by the activity specified in Item 12 of the Contract Security Classification Specification (DD Form 254, July 1, 1967).

New Subscription Service Offered by Commerce Department

A new subscription service for obtaining microfiche copies of scientific and technical documents by field of interest is available from the Commerce Department's Clearinghouse for Scientific and Technical Information. The new service, Selective Dissemination of Microfiche (SDM), offers to customers unclassified reports and translations of foreign technical literature in any of several hundred categories.

By offering copies by subject category, originating agency and subject category within an originating agency, the service will eliminate the need for individual orders for documents.

SDM distribution will be made twice each month. Information on categories, cost and ordering methods can be obtained by writing Clearinghouse (152.12), U.S. Department of Commerce, Springfield, Va. 22151.

Crew Chiefs Upgrade System Support

Major General Fred J. Ascani, USAF

The continuing shortage of research and development money, combined with the same lack in the area of acquisition, precludes timely modernization of the existing defense force structure. This makes it mandatory that increased emphasis be placed upon the continued reliability and supportability of current Air Force weapon systems and subsystems. It is evident that improved management effectiveness will be required if these objectives are to be attained.

To overcome these limitations—and to provide the necessary managerial capability—the Air Force Logistics Command (AFLC) developed the AFLC System Manager Program to assure adequate monitoring of Air Force systems throughout their life span, from development through phase-out. The program is designed to upgrade AFLC's support of weapon systems, but at the same time to stay within current constraints—budgetary and others.

Within AFLC, the individual designated to perform this function is the system manager, known in-house as the "crew chief."

The system manager is supposed to be *the* expert on his system. He is expected to know its status and health at all times. His relationship to his system is roughly the same as that of a crew chief to an individual aircraft; hence, the nickname, "crew chief," for AFLC's system managers.

As the AFLC commander's personal agent, the system manager speaks with command authority in matters pertaining to his assigned system.

Basically, the system manager has total responsibility for the system he manages. He is the single individual in AFLC who can be called upon to answer every question about his system: the design aspects and production status of all components; its performance characteristics and operational employment; its deficiencies and any remedial action required; the financial aspects and status of funds; in other words, the complete logistic story of his system from conception to phase-out.

A close relationship with other Air Force units is maintained at every stage of a system's life cycle.

Logistics Considered at Every Phase

From the beginning, the system manager influences design by providing logistic requirements, intelligence and constraints to the developing agency. During the contract definition phase, he assures that logistic requirements are built into the acquisition contract. During the acquisition phase, he insures that logistic requirements will be satisfied.

As the system enters the operational phase, he maintains constant surveillance over it, seeking to improve the basic design and to assure that the using activity operates and maintains the system within its capabilities and those of the logistic system. One of the most important tasks of the AFLC system manager is to develop an effective logistic response capability for the first operational unit and all subsequent organizational activations and conversions.

Working closely with the prime contractor, subcontractor, vendors, using activities and, particularly, the Air Force Systems Command's System Program Office (SPO), he is responsible for organizing the AFLC logistic effort. From conception onward, AFLC specialists—under the system manager—serve as principal logistic advisors on new systems. They carry out preliminary logistic planning concurrently with planning for research, development and testing of a system. Working as an integral part of the SPO, they participate in all logistic planning, spelling out how the system will be supported during every phase of its life cycle.

During the updating and rewriting of specifications, AFLC system managers develop new criteria and requirements for contractor change proposals, prepare data for updating budgets and programming data, and assist in the technical evaluation of the system's components to insure operational supportability, maintainability and reliability.

Thus, the system manager must essentially be an experienced and competent organizer, manager and integrator, fitting all of the complex parts of the logistic system together. His objective—and his prime responsibility—is to fit them together on a timely basis in a coordinated effort to meet the requirements of his customer—the using command.

The AFLC system manager is not

Major General Fred J. Ascani, USAF, is Deputy Chief of Staff for Operations at Headquarters, Air Force Logistics Command, Wright-Patterson AFB, Ohio. Before assignment to AFLC in July 1967, he served as vice commander of the Fifth Air Force. General Ascani is a graduate of the U. S. Military Academy and received his wings in 1942.

bound by arbitrary limitations on the scope of his activities. He is expected to move aggressively into any area involving his system. In dealing with other Air Force activities, other agencies and contractors, he speaks with the authority of the AFLC commander.

His responsibility ends only when the Air Force no longer has logistic responsibility for the system.

Choosing Systems for Logistic Management

Which systems will call for designation of an AFLC system manager? Primary considerations for determining this decision center around program cost, inventory size, configuration complexity, program duration, and priority and precedence.

But these are only the general guidelines which have been established for determining which system, project, or end item should have the special attention of a system manager. Weighting factors or special formulas for comparing one system against another have not been developed; nor is such action desirable. Each system, subsystem, project and item must be evaluated in relation to its own complexity and criticality, and not in relation to another program or project.

The need for special management attention is obviously greater at the system level because of the degree and magnitude of management integrated functions.

For example, AFLC system manager procedures apply to aeronautical systems, missile and space systems, and communications and electronic systems. Each is individually evaluated to determine the justification for an AFLC system manager and the organizational level of assignment.

Complete systems usually are assigned at division organizational level with one of AFLC's five air material areas (AMAs).

A number of subsystems are also assigned system managers. These include propulsion subsystems, electronic warfare subsystems, avionic subsystems, and reconnaissance subsystems. Criteria used in this determination are patterned after the criteria for complete systems.

In the final analysis, sound judgment, program familiarity and knowledge of problems are probably the best criteria. The final decision as to which system, subsystem, project, or item requires the assignment of an AFLC system manager is delegated to the AMA commander to whom complete logistic responsibility has been assigned.

System Manager Assigned Early

Recently, AFLC Commander General Jack G. Merrell established a policy of early assignment of system managers. Assigning a system to an AMA as early as possible, General Merrell points out, ". . . provide[s] the opportunity for AMA logisticians to influence design and development of the hardware and to acquire the required capability to support the system throughout its operational life."

Accordingly, the early assignment of system manager responsibilities has also become a prime AFLC policy. Assignments are made concurrently with the establishment of the SPO and are essential to assure effective participation by AMA-level logisticians in the decision-making processes which occur during the very early phases of the system.

Integrated logistic support planning and management requires a dynamic working relationship between the acquisition managers and the AMA logisticians. The early recognition of AMA responsibilities is fundamental to the success of the AFLC system manager program.

Army Announces New R & D Labs at Belvoir

The U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va., has announced the establishment of a new laboratory and the upgrading of a former division to laboratory status.

The Advanced Systems Laboratory was established to provide the center capability of using modern analytical methods to determine the best ways of mixing hardware, utilizing existing and future devices for most efficiency, and gaining greatest use from any given research and development effort.

The status change involved the former Electromagnetic Effects Division of the Electrotechnology Laboratory, which will now be known as the Electromagnetic Effects Laboratory. The new laboratory is the Army's leading agency in the electromagnetic pulse (EMP) nuclear weapons effect field. It is responsible for theoretical and experimental applied research on EMP effects, and applications of research results for the protection of Army materiel.

Major Thomas H. Huber, former Acting Deputy Commander of the Research and Development Center, has been named to head the Advanced Systems Laboratory. Donald B. Dinger, chief of the Electromagnetic Effects Division, remains head as it assumes status as a laboratory.

Tri-Service Office To Standardize Equipment for Fire Fighting

A tri-Service office for standardization of military airfield fire fighting equipment has been established at the Air Force System Command's Aeronautical Systems Division, Wright-Patterson AFB, Ohio.

The Fire Fighting and Crash Rescue Equipment Systems Program Office (SPO) was set up on the recommendation of a Defense Department study group which found a wide variety of equipment in use by the three Services and a lack of established studies on future equipment needs. The office will be headed by Lieutenant Colonel Robert B. Artz, USAF, with representatives of the Army, Navy and Air Force present.

In addition to developing and purchasing fire fighting and rescue hardware, the office will establish test and evaluation criteria for all such Defense Department equipment and standardize fire fighting techniques among the Services.

The office will also conduct investigations into flight hazard potential, operational environment, fire suppression and rescue capability, survival criteria and fire itself.

The SPO will have responsibility for procurement of the following equipment: vehicles, extinguishers and related fire extinguishing agents and dispensing equipment, fire prevention equipment (runway foam vehicles), ground rescue systems and related equipment, fire protective clothing, and mobile tactical systems for the U.S. Marine Corps.

Defense PPBS—A 1969 Overview

Cdr Steven Lazarus, USN

[Editor's Note: The following is adapted from an unpublished article by the author titled, "PPBS: Retrospect and Prospect." A diagram illustrating the Defense PPBS appears on pages 20 and 21 in this issue.]

In July 1965, *Fortune* magazine published an article on defense management which contained an illustration entitled, "Mr. Hitch's Marvelous Budget-Making Machine." Almost four years have passed since the appearance of this serpentine diagram, and a number of changes have taken place. It seems worthwhile to describe and illustrate the Defense Planning - Programming - Budgeting System (PPBS) as it exists in the spring of 1969, if only as a reference point against which to measure future change.

November to March

Late in the calendar year, while the budget analysts in the Office of the Secretary of Defense are grappling with the next fiscal year's budget, the Joint Staff of the Joint Chiefs of Staff is busy formulating the Joint Strategic Objectives Plan (JSOP). This planning effort involves the digestion of masses of intelligence data to arrive at an estimate of the capabilities and proclivities of potential enemies, and the assessment of the present capabilities of U.S. forces and weapons, as well as the technological advances expected shortly from the vast defense research establishment. The plan is a military judgment as to the forces and programs which should be supported the next five to eight years.

April to August

After the JSOP is formally presented early in March, a series of Draft Presidential Memoranda (DPMs) is prepared. The words "draft" and "presidential" are important. The memoranda are drafts because they are tentative and the guidance they contain is subject to considerable modification during the year. Indeed, in an earlier form, the documentation which appeared in the spring was called tentative force guidance. They are Presidential in the sense that they are advisory notifications to the President who can accept or reject them and, as such, they are privileged. They are actually summaries of conclusions drawn from special studies and analyses which also take place in the spring. They attempt to evaluate the major issues inherent in the JSOP and in the overall environment in order to establish priorities and determine the best, least-cost anwers to major questions of military necessity.

The DPMs and their non-force-oriented counterparts, the Draft Guidance Memoranda (DGMs), establish the frame of reference for programming in DOD. The Military Departments respond to these policies with Program Change Requests (PCRs), calculated to reshape their resource requirements in order to achieve the force capabilities stipulated in the DPMs. At this point (by submitting an alternative PCR) and at several other points in the annual decision-making flow, the Military Departments have an opportunity to appeal the policy decision. Critics who argue that PPBS in its DOD manifestation is unnecessarily repetitive forget that the successive iterations provide a reasonable degree of procedural and substantive due process for all parties.

The PCRs are analyzed and the Secretary of Defense renders a Program Change Decision (PCD) on each. PCRs and PCDs are highly formalized documents structured in terms which correspond to the Five-Year Defense Program (FYDP). Thus, when the Secretary of Defense signs a PCD, he is agreeing to, for example, an increase of $10 million in the operating costs associated with a particular program element for each of the next five years. The decision is converted to computer tape and the FYDP is updated shortly thereafter. Thus, the FYDP, as it exists in the tapes and memory banks of the OSD computers, is, with the exception of one major period, always up to date.

Theoretically the special study—DPM-PCR-PCD flow—is concluded in early August (actually there has always been slippage) and an FYDP, up to date as of August 31, is available as a departure point for the formulation of the next year's budget. The term "departure point" rather than "ceiling" is used because guidance concerning the budget submission always provides for inclusion of items outside the approved program. These, however, are usually identified separately, segregated from the primary budget submission, and designated as "addendum." The basic budget is generally an expression of the near-term year of the updated FYDP.

October to December

Budget analysis in an important sense is the final scrub of the first program year. Admittedly, there are those who are discomforted when decisions are continually reopened for review, but shifting conditions are facts of life. Changing prices, economic escalation, technological breakthroughs, new threats, additional and more accurate information, fresh insights, all require that the DOD decision-making process remain dynamic. The budget analysis period is also the point at which the defense program impacts the national program, and it is reasonable to expect that neither will remain unmodified after such a collision. The demands of the congressional appropriation structure require that the program be translated back into input terms and this, too, is accomplished during the budget review.

During this period the budget estimates submitted by the Military Departments are exploded into analyzable pieces, each of which is evaluated and presented to the Secretary of Defense for decision. In 1967 and

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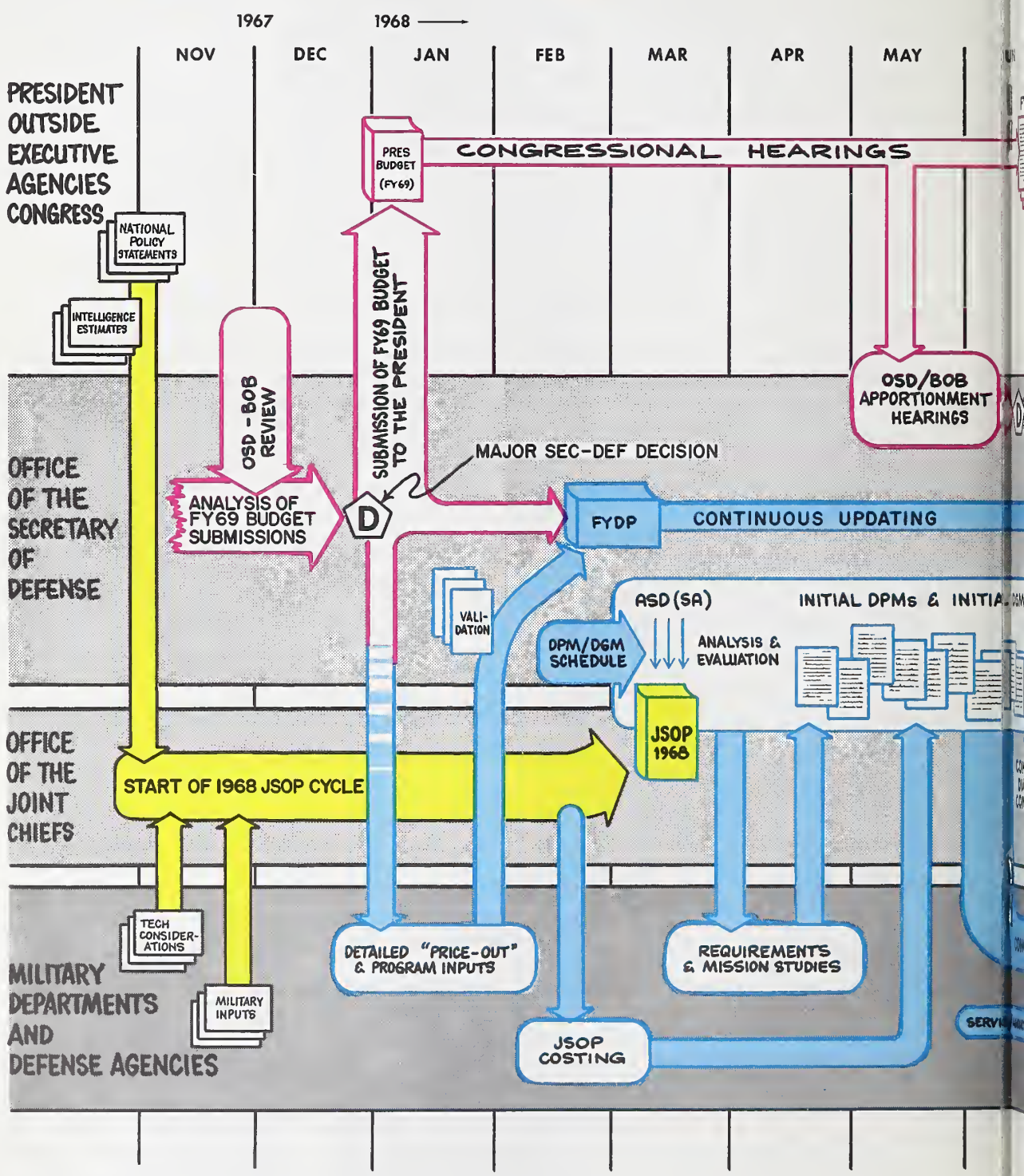
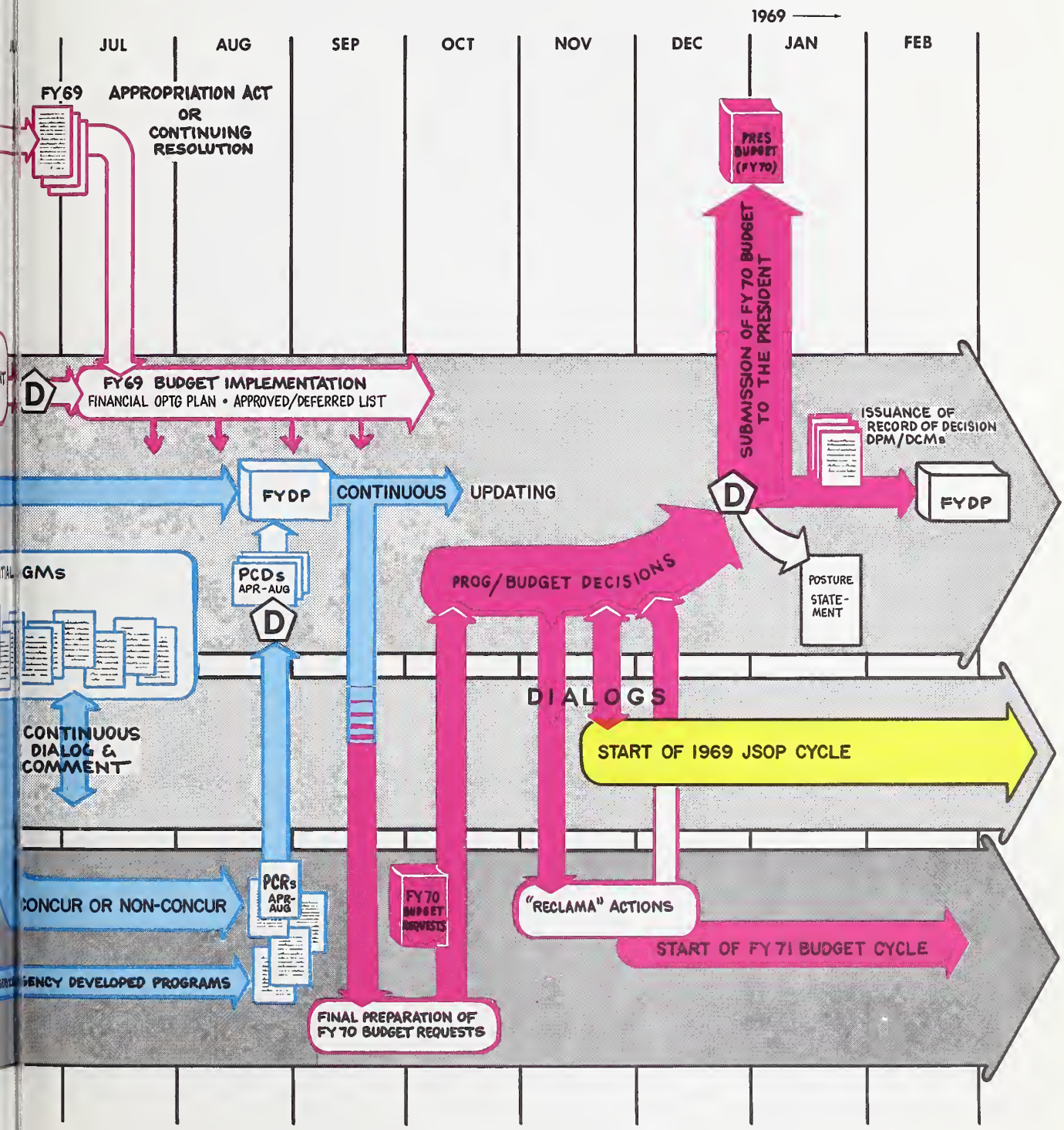
The PLANNING PROGRAMMING



NG BUDGETING SYSTEM



1968, the Secretary made 450 such program/budget decisions (PBDs). About 50 percent of these are the subjects of a reclama or appeal from the Military Departments involved, and about a quarter of these appeals result in changed decisions.

This appeal/review cycle is an indication of how priorities are established in the budget process. Actually the approved program sets the first priorities. The budget submission itself is usually divided into a basic and addendum budget. The basic budget is restricted to items included in the approved program, while the addendum budget includes additional requirements which have not been evaluated during the programming cycle, or have failed program approval. The reclama process is a form of appellate review and, since choices must be made in determining which items to reclama, this process tends to indicate priorities.

During the budget analysis period, the Military Departments and Defense Agencies have two formal opportunities and a host of informal oportunities to discuss critical decisions with the Secretary of Defense. Items selected for these discussions represent a structuring of priorities. The budget analysis period, thus, operates as a crucible continually precipitating out items, either through acceptance or rejection, and into which the more important of the rejected items are reintroduced until the residue becomes the most important of the remaining items in controversy. When resolved, the budget is complete (at least from the DOD standpoint).

The budget analysis period is an intensive look at resource allocation, but only in a two-year (current and budget year) time dimension. At this point PPBS is stood on its ear and the budget decisions are extended forward to reflect their five- and eight-year ramifications. This winter update of the FYDP is one of the weakest links in the programming chain for it is essentially a case of the two-year tail wagging the five-year dog. The update currently in progress has been to a degree facilitated by the availability of "Record of Decision" DPMs which presumably reflect the FY 1970 budget decisions, but the compressed time frame for the preparation of these DPMs and of the update itself operates to reduce the quality of the final product.

January to June

The Defense Department budget estimates are incorporated into the President's Budget and presented to the Congress in January. Throughout the spring and into the summer the Congress, particularly the two Appropriations and the two Armed Services Committees, holds hearings and takes testimony on the Defense Department portion. The House of Representatives and the Senate vote separately on the defense appropriations bills and the differences are normally resolved through conference committees. Conference committee bills also require the approval of both houses of Congress. This lengthy review and legislative process typically extends beyond the end of the fiscal year. The FY 1969 program was not appropriated until October 1968, four months into the fiscal year it was designed to finance.

The limitations of the calendar are circumvented in two ways. From July 1 until the passage of the bill, DOD operates on the basis of a "continuing resolution" passed by Congress for a stipulated period. The resolution provides for operation at the same rates and constrained by the same provision as existed the previous fiscal year. Secondly, even without a formally approved appropriations act, the Executive Branch *apportions* or distributes the anticipated appropriation in June. Apportionment, while formally understood as a distribution which provides the Executive Branch with a limiting or rate-setting mechanism, is also a second- or mid-term budget analysis during which any changes which have occurred in the intervening six months are recognized. Financial operating plans are presented by the Military Departments and Defense Agencies and it is at this time that the Secretary of Defense exercises his key legislative authority, as expressed in Title IV of the National Security Act, to approve obligation rates.

The Assistant Secretary of Defense (Comptroller) issues operating budgets covering the operations appropriations (operation and maintenance and military personnel), and maintains item control in the procurement area by means of an "approved/deferred list," and in the research and development area by means of a "research, development, test and evaluation program/fund authorization." Specific construction projects must be approved by the Assistant Secretary of Defense (Installations and Logistics), and approval for financing them is given by the Assistant Secretary of Defense (Comptroller). It is apparent that the Secretary of Defense retains careful and detailed control over resource allocation until the last possible moment.

Currently, the Assistant Secretaries of Defense (Comptroller) and (Systems Analysis) are actively working with the Service Secretaries to simplify and streamline the DOD decision-making process. A PPB Improvement Committee, composed of representatives of the Office of the Secretary of Defense and the Military Services, has produced 54 proposals for improvement, some of which are already being incorporated into the 1969 cycle. These include reduction of the number of DPMs/DGMs, simplification of cost detail requirements in PCRs, identification of specific PCRs required by DPMs/DGMs (an extension of the procedure used during 1968), and clarification of the relationship between specific DPMs and specific program elements.

Under serious consideration for the 1970 cycle is the publication, in late winter-early spring, of two major Draft Presidential Memoranda on Strategic Forces and General Purpose Forces which would serve as an integrating framework for all subsequent program memoranda, and would provide general guidance on anticipated level of investment by mission. A study is under way to determine the feasibility of examining the budget in five-year terms.

A decision-making process cannot be set in concrete. It must remain dynamic and susceptible to change if it is to retain its utility. As the parties to it gain more experience with it, improvement becomes obvious and necessary. Change can be aggravating, but obsolescence is a far greater danger. Organizations, like organisms, must adapt or they become anachronistic, atrophy, and eventually disappear. While Planning-Programming-Budget Systems as we know them today (and as we knew their predecessor systems 10 years ago) may not be the ultimate answer, they appear to be useful and adaptable. They are worthy of study and thoughtful consideration.

Management of Research and Development in an Air Force Laboratory

Colonel George A. Zahn, USAF

In an organization as large and complex as the Defense Department, planning for research and development is a difficult and complicated process. It involves short-range goals to meet critical needs of the operational units; medium-range goals to provide new capabilities afforded by expanding technology; and long-range goals to insure a continuing flow of new technology into the mainstream. Planning must consider the unique requirements of the Army, Navy and Air Force; yet it must insure an integrated defense posture which, hopefully, will deter warfare but, if unsuccessful in this pursuit, will win any conflict in which the United States engages.

Dr. John S. Foster Jr., Director of Defense Research and Engineering, has stated:

> Today, the survival of every nation and the life of every man on earth is touched by powerful new strategic weapons and the changing military capabilities of the major powers. These capabilities, in turn, are increasingly dependent upon advanced technology. The job of military research and development is to preserve our margin of safety—some choose to call it a margin of superiority—to deter war, and to make us able to respond decisively should war occur. Military research and development is the leading edge of our national security and provides new opportunities to increase the effectiveness of our Armed Forces.

With respect to planning and management, Dr. Foster goes on to say:

> In one sense, our research and development strategy is similar to that of other management groups. For a relatively few (roughly 100), large or particularly important programs (tens of millions of dollars), we can and must manage in detail. Some examples of these programs are the Sentinel ballistic missile defense, new aircraft (such as the anti-submarine VSX), new missiles (such as the Poseidon), and space efforts (such as the Manned Orbiting Laboratory). On the other hand, for the very large number (tens of thousands) of smaller projects, we attempt to set only broad priorities. This involves examining clusters of projects in terms of the traditional academic disciplines and in terms of technological or functional areas such as electronic countermeasures. Once broad priorities are established, most of the management of smaller programs is performed by the military departments.

General James Ferguson, Commander of the Air Force Systems Command, is responsible for the research and development effort within the Air Force. He points out:

> There is no perfect management system universally applicable to every set of circumstances. Just as the pace of technological advance has accelerated in recent years, there has been a commensurate expansion in the range of management options. Today there are more numerous tools, techniques, functions and organizations; each may be well suited to one case, yet none can be applied to every situation.
>
> Traditionally, the mission of research and development has been futuristic. It still is. But the future is any point ahead of us in time. It can be 10 seconds, 10 minutes, or 10 years away.

With regard to what he terms "our responsibilities for responsiveness," General Ferguson referred as follows to a three-pronged concept which he has advocated strongly since taking over command:

> The necessary facets are *professional management*, or the ability to adjust to the changing defense environment; *operational responsiveness*, or the application of talents and technology to operational capabilities; and *development planning*, the capability to formulate realistic proposals that can compete favorably for approval and funding of future weapon systems.

The Rome Air Development Center (RADC) is one of the Air Force

Colonel George A. Zahn, USAF, is Commander of the Rome Air Development Center, Griffiss AFB, N. Y. In prior assignments, he has served as Deputy for Communications Systems with the Electronic Systems Division of the Air Force Systems Command; and organized and commanded the first Defense Communications Agency organization in the European area. Colonel Zahn holds a bachelor's degree in electrical engineering from the University of Dayton.

laboratories upon which General Ferguson relies in providing new technology. It is one of the nine laboratories reporting the Director of Laboratories (DOL) within the Air Force Systems Command (AFSC). Located at Griffiss AFB in Rome, N. Y., RADC is assigned the technical mission for development in ground-based electronics and electromagnetics. This includes the full spectrum of activities ranging from exploratory and advanced development through operational and system support in these disciplines.

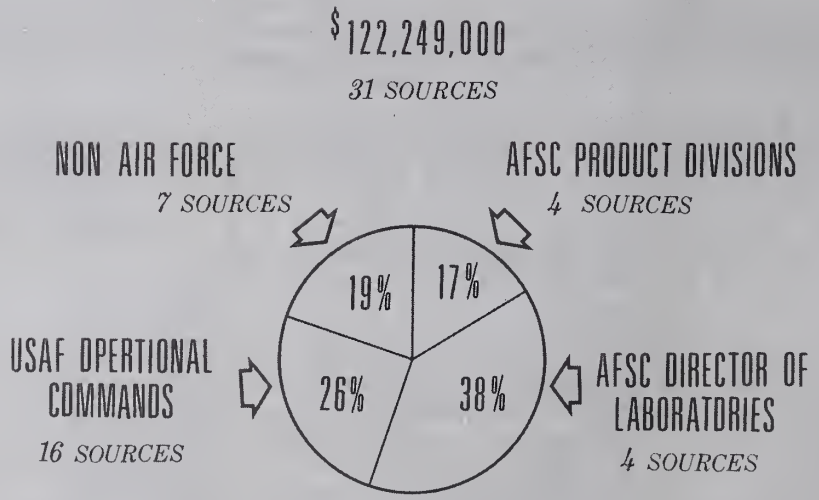
The broad scope of this activity, combined with extensive in-house development, provides experience, background and competence to fulfill the three functions of professional management, development planning, and operational responsiveness. Two examples of the laboratory's role in all three functions may be cited.

The first is RADC pioneering in the development of phased arrays starting in the early 1950s. Predicted vehicle speeds and target density indicated at that time that conventional radars, using mechanical motion for beam scanning, could not fulfill many future operational needs. Some earlier exploratory development in step-scan techniques and in high-power klystrons for master oscillator-power amplifier transmitters provided a starting point for the phased array concept. Internal laboratory planning and management initiated exploratory development on antenna elements, cross coupling, phase control techniques, and an experimental 10-by-10 element array.

By the late 1950s, the reality of space surveillance needs caused increased emphasis. DOD/Advanced Research Projects Agency support in the early 1960s resulted in an experimental Electronically Steerable Array Radar (ESAR). Later, in conjunction with the Electronic Systems Division of AFSC, RADC provided the engineering and contract control for an operational Space Surveillance Radar, the AN/FPS–85, located at Eglin AFB, Fla. This series of efforts, over a period of 15 years, required a coordination of the work of hundreds of scientists and engineers in industry and universities, as well as in government laboratories. Close to $100 million have been expended in this technological development, primarily with industry. Due to its inherent flexibility, the phased array approach is now a strong contender for other uses, such as smaller tactical type equipment and for airborne applications.

The second example is RADC's reliability techniques program dating from 1956. It was realized then that the reliability problems faced by the Air Force could be solved only with a well planned, continuing program that would keep pace with the expanding demands on system performance. The general philosophy of the RADC program was, and still is, that reliability must be inherent in the equipment design. Post-production and field-use fixes cannot significantly improve a design that has poor reliability. Reliability must be considered as a design criterion along with the usual performance parameters. The RADC program in reliability prediction addressed itself to this objective through the development of techniques that would allow a designer to quantitatively predict the reliability of his product, and to assess the effects of factors such as design approach, parts derating, parts procurement practices, and use environment.

In recognition of these problems, RADC initiated a "Physics of Failure" program early in 1961. The



Source of RADC funds - FY 68

general objective of the program was to relate fundamental change processes that take place in electronic materials at the atomic and molecular level to changes in electrical characteristics of a device. This information could then be applied to the improvement and assessment of reliability in electronic equipments.

This program has been implemented through a combination of in-house and contractual studies, designed to furnish a much needed physical basis for the statistical methods commonly used in reliability engineering. This approach has been accepted widely, as evidenced by the increasing number of reliability physics groups, similar to RADC's, which have been formed by both vendors and users, particularly in the solid state industry.

The experience and capability developed in the RADC reliability program led AFSC headquarters to request RADC to develop and establish, at Griffiss AFB, a Reliability Analysis Center (RAC) to serve as the Air Force focal point for the acquisition, storage, reduction, analysis, and dissemination of reliability experience data. RAC's present scope is microelectronics and semiconductor devices. Plans have been formed to increase the scope to electronic and electromechanical devices.

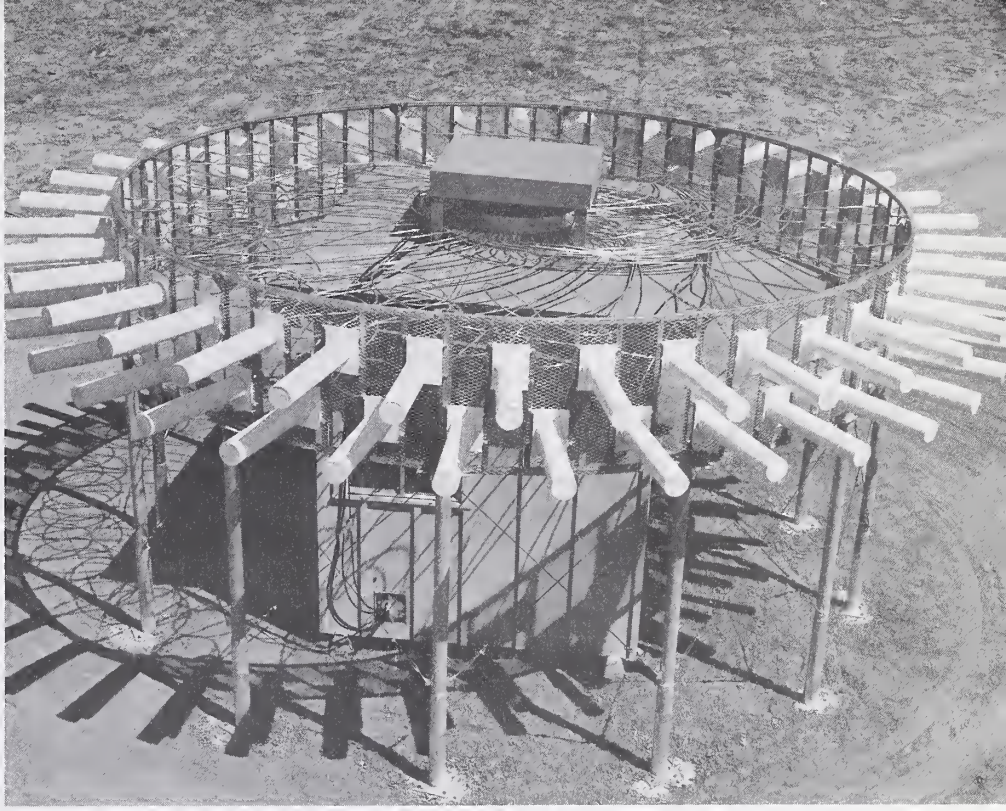
Major Areas of RADC Mission

In order to place RADC's research and development activity in proper context, a description of its laboratory, its resources, and its mission is necessary. Over 1,500 civilian and military people are employed at RADC, about half of whom are scientists or engineers. Office and laboratory space occupies one million square feet and, in addition, there are 16 off-base sites for experimental purposes. The Flight Test Division has 11 aircraft, all instrumented with unique equipment for performing a wide variety of experimental electronic and electromagnetic measurements. RADC funds, which normally exceed $120 million annually, come from 31 different customers.

There are well defined areas in the assigned technical mission of RADC in ground-based electronics and electromagnetics:

- **Data or Information Acquisition.**

Both active and passive techniques and components must be considered. Consequently, our mission includes the development of radar techniques and components, such as antennas; transmitters; receivers; signal-processing, transmission-line, and pulse-compression equipments and phased arrays. Passive techniques include wide-band antennas for signal receiving and direction finding, goniometers, wide-band scanning receivers, and signal-processing devices.



An array and goniometer field installation for passive acquisition of electromagnetic information.

- **Data or Information Transmission.**

Communications is the "name of this game" and it is very important in both strategic and tactical environments. Data or information is usually required at a place other than its point of acquisition. Thus, techniques must be developed for transmitting increasingly large amounts of data from one point to another—and in space application over vast distances. This may be accomplished by wire, radio, tropospheric or ionospheric scatter, or satellite, using analogue or digital procedures, voice or message, or by any combination of these. Antennas, switches, transmitters, modulators, demodulators, multiplexers, receivers, wide-band components, coders, and error-detection and correction devices, all must be developed to handle the ever increasing amounts of data.

- **Data or Information Processing.**

An immense amount of data is acquired by our reconnaissance and intelligence systems and aerospace defense radars, collected on various communications networks, and delivered to our command and control systems. This data must be analyzed so that the intelligence in the information can be extracted and made meaningful to a user. RADC is involved in many types of data processing, and in the applications of data processing techniques to specific Air Force problems.

- **Automatic Language Translation**

In addition to the operational type data enumerated, technical publications contain numerous articles in various languages. Translation of this information is essential and presents an increasingly significant task which we desire to perform automatically to the greatest extent possible. Therefore, we have a program to develop data processing techniques for automatic language translation, including the input and output devices as well

as the main frame memory systems and actual hardware. This is not just a simple dictionary-type lookup on a word-to-word basis. Rather, the sentences in one language format must be translated into meaningful, proper English grammar. Along the same lines, *i.e.*, handling of textual data, we are interested in evolving techniques for automatic abstracting, indexing and retrieval.

We also are involved in the automation of as much of the processing as is possible in the preparation of charts and other cartographic data. This includes photo interpretation and the automatic scanning of photographs, maps and charts to facilitate the extraction of intelligence from these materials.

- **Display Techniques.**

More and more the computer is becoming the heart of command and control systems, in communications, and in display devices. Thus, technology must be worked out for the interface between data processing and the other functions of command and control systems. Also, effort must go into the software and the peripheral equipments required for the proper utilization of data processing techniques in our Air Force environment.

We are concerned with the display subsystem—that part of the overall electronic system which finally presents the information to a decision maker. Here, we are involved in real-time display techniques to keep key people informed of changes as they occur. This requires a great deal of research and development on display devices, on new materials for electro-luminescent or bipolar crystals, on reusable film in cases where we cannot have real time, on multicolor displays, and on the various human engineering factors involved in making the display easily understood and assimilated by the viewer. One of the key problem areas in real-time display, at least for large-scale displays, is the cost-per-resolution element. This cost is very much affected by the brightness of the display element and by the switching circuits required for their activation. Millions of such elements will be needed in order to present the large-scale type of display now used, *e.g.*, Strategic Air Command headquarters, in presenting in multicolor air and missile fleet status information required by that headquarters. In almost all cases, that headquarters now uses a display system which in some manner employs the projection of film.

Lightweight troposcatter equipment, developed by RADC, undergoes tests at Eglin AFB, Fla.

In addition to the foregoing, there exists a requirement for research and development on the reliability of the electronic system components, and on electromagnetic compatibility between various elements and subsystems. If our equipments are to operate with a high degree effectiveness, they must not interfere with each other. We must devise methods for measuring interferences that might be expected in new equipments that are to be placed in operation. We must determine the extent of their vulnerability to other signals, and insure that electronic systems effectiveness is not reduced by excessive interference.

Management of Effort and Resources

All of the foregoing forms the major part of the mission at the Rome Air Development Center. Management's problem is to assure that a good balance is maintained between the amount of effort and the resources provided in each of the areas. We want to be sure that as technology within one area increases, its application will not be hindered by gaps in the technology of other areas. Maintenance of good balance of effort in all of these areas is essential.

Advances in the state of the art in technology are stimulated by two essentially independent processes. The first is natural curiosity and creativity in exploring unknown fields. Nuclear power, the laser, and solid state electronics are but a few of the breakthroughs in technology that have occurred recently. The second is responsiveness to stated problems and requirements. This second type of research and development, which generally leads to incremental improvements in the state of the art, is particularly important during periods of conflict such as that in Southeast Asia.

It is essential that a portion of our resources be reserved for research and development of the first type which leads to new technology —solutions looking for problems. Breakthroughs in the first category lead to an entirely new cycle in the second category.

In each category the preponderance of the ideas originate from within the laboratories, but the execution of these is controlled at higher echelons.

Based on its knowledge of technology and operational requirements, the Office of the Secretary of Defense (OSD) sets broad policy guidelines. Further, it exerts strong influence on the laboratory's program through the control of funds and facilities. The laboratory director also obtains guidance from the OSD level by observing the type of program that OSD manages in detail at its level. The selection of such programs is a good indication of DOD emphasis and priority.

Air Force headquarters uses OSD policy guidelines and information as bases for preparing its guidance for the Air Force Systems Command. This guidance comes generally in the form of the Planning Concepts Document and Program Change Proposals. Additional control of funds and resources is exercised at the Air Force headquarters level, always with the two-way communications, both up and down, necessary for good management.

The Air Force Systems Command controls its laboratories through the Director of Laboratories (DOL). Within the command are the systems divisions responsible for acquiring new operational systems, and the laboratories to provide new technology for the new systems. The DOL prepares the Long Range Plan which looks ahead 10 years and attempts to forecast the requirements for new technology and the approaches required for solving the problems. Technical Objective Documents (TODs), prepared by the laboratories, are published by the DOL. There are approximately 40 TODs covering major technological areas, and each TOD contains several specific technical objectives. Each of the technical objectives discusses the state of the art in the particular area, the areas which limit the state of the art, and possible approaches which might advance the state of the art. These TODs serve two important functions. First, they require the working-level scientists and engineers in the laboratory to assess their technology and forecast where that technology is heading. This can influence decisions at higher levels. Second, they are given wide distribution to industry where they can be used to set up corporate goals consistent with national goals. (See article, "U.S. Air Force Technical Objective Document Program," *Defense Industry Bulletin,* December 1968, page 14.)

The laboratory prepares its programs, utilizing to the best advantage the guidance it receives from its higher echelons. However, it does much more than this. It reacts constantly to the needs of the systems divisions of AFSC and of the operating commands. For example, the systems divisions prepare Technology Needs (TNs) with which they task the laboratories. These TNs describe operational deficiencies, limitations, blocks to improvement, or problems which have not been solved satisfactorily. The laboratory is expected to respond to these needs, either by identifying technology which will solve these problems, or by incorporating the requirement into its exploratory development program. The laboratory also works directly with the customer. For example, RADC works directly with the Aeronautical Chart and Information Center in the development of automatic cartographic capabilities. Similarly, we work directly with the Seventh Air Force in Southeast Asia, implementing the latest reconnaissance interpretation techniques.

The laboratory works directly with industry and universities, discussing requirements and ideas for new technology or applications of new technology. This technical exchange takes place through formal procedures, such as Technology Reviews, Independent Research and Development Program Reviews, etc., and through informal discussions between engineers and scientists in the laboratory or at symposia. Industry responds with unsolicited proposals based on knowledge of Air Force requirements. RADC accepted 44 out of 256 unsolicited proposals last year, or about one out of every six received.

Finally, the laboratory prepares its technical program plan for the following two fiscal years. This plan is composed of hundreds of individual line items (at RADC this involved about 1,500 specific efforts) which are grouped into the various project areas assigned to the laboratory. These represent the best technical judgment of the laboratory. On the basis of this plan, contracts are negotiated with industry and universities; and in-house work is initiated to provide a solid research and development program.

To be successful, the laboratory research and development program must be dynamic. It must contain all of the new pertinent technology and reach out as far as possible. It must not be satisfied with only small increments of improvement or change.

The program must be flexible. It must be capable of making room for new ideas that are generated. As priorities change or new requirements arise, it must be willing to bury old horses and place bets on the new ones.

The program must be responsive. This is particularly true in times of conflict when the lives of men may very well depend upon the laboratory output.

The program must be updated continuously to provide the best possible balance considering the need for new technology, the applications of technology to operational requirements, and the constraints of money and manpower.

Navy To Retire 19 Ships

The Navy has announced the names of 19 ships to be retired and five to be transferred to reserve status as part of the FY 1970 fleet cutback. The action is aimed at meeting a budget reduction of $26 million.

The ships to retired are the USS Irex (SS–482), USS Waller (DD–466), USS Taylor (DD–468), USS Walker (DD–517), USS Jenkins (DD–447), USS Fletcher (DD–445), USS Black (DD–666), USS Marshall (DD–676), USS Vammen (DE–644), USS March (DE–699), USS Whitehurst (DE–634), USS Falgout (DER–324), USS Vance (DER–387), USS Haverfield (DER–393), USS Wilhoite (DER–397), USS Aludra (AF–55), USS Shasta (AE–6) and an unnamed diesel submarine.

The five ships to be transferred to Naval Reserve training status are the destroyers USS Huntington (DD–781), USS Maddox (DD–731), USS S. Moore (DD–747), USS H.E. Hubbard (DD–748) and USS Brush (DD–745).

Also part of the FY 1970 reduction is the temporary inactivation of Patrol Squadron 7, based at Jacksonville, Fla. The squadron will be placed in a stand-down status pending transition from P–2 to P–3 aircraft, scheduled for about April 1970.

DOD Administration of Military Assistance Program and Foreign Military Sales

Address by Lt. Gen. Robert H. Warren, USAF, Dep. Asst. Secretary of Defense (Military Assistance & Sales), Office of Asst. Secretary of Defense (International Security Affairs), at the Aerospace Industries Association of America International Committee Meeting, Washington, D. C., March 26, 1969.

I am pleased to participate in this Aerospace Industries Association meeting. I am aware of the importance and effectiveness of your activities in support of our national objectives, and particularly their contributions to our Military Assistance Program (MAP) and Foreign Military Sales (FMS).

These are my subjects today. I wish they were new and fascinating. Unfortunately, they are complex and sometimes controversial. Both involve many rather routine facts and figures. Military assistance and sales are, however, most important to our world-wide policy of collective security and, I hope, matters of interest to this important organization.

Today, I hope to bring you up to date on our current activities and look briefly into the future; and to comment on the presently on-going reorganization of military assistance grant aid and Foreign Military Sales operations in Office of the Secretary of Defense (OSD), possible policy changes, and the Military Assistance Program.

First, the OSD reorganization: Two separate major offices in OSD's International Security Affairs (ISA) have been responsible for foreign military sales (International Logistics Negotiations) and military assistance grant aid programs (Director of Military Assistance).

Effective 12 days ago, these functions were combined in a single new office under the Deputy Assistant Secretary for Military Assistance and Sales.

Military assistance and sales were, as I am sure you know, first authorized by the Mutual Defense Assistance Act of 1949. Ever since General Lemnitzer headed the original office of Military Assistance in the early 1950s, there has been an organizational unit in ISA charged with administering these programs for the Secretary of Defense. Both grant aid and sales assistance continued to be provided under the authority of the Foreign Assistance Act and predecessor mutual security legislation until enactment of the Foreign Military Sales Act of 1968.

Although still dependent on common legislation, grant aid and sales became separate administrative functions within ISA when the Office of International Logistics Negotiations was established five years ago under Henry Kuss, who has departed from government service. The very recent re-combining of these grant and sales functions in the new single office is a logical move for several good reasons:

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- The transition from grant aid to sales is well advanced. The curve of delivery on a sales basis crossed that of grant aid in 1962.
- The reduction in grant aid and the corresponding increase in sales will continue as our allies become more self-sufficient and better able, financially, to support adequate military establishments.
- The severe pressure on our total national resources, stemming from the cost of the war in Southeast Asia and increasingly urgent domestic needs, make it more essential that all foreign assistance activities be closely coordinated. Military assistance and sales, and the several forms of economic aid as well, must all work together to promote the security and foreign policy objectives of the United States. Duplication, waste, or competition among them cannot be tolorated if increasingly limited appropriations for these related purposes are to make optimum contribution to attainment of those objectives.

Both MAP and FMS legislation includes numerous provisions and restrictions, designed to insure proper control of arms transfers and to make certain that they support national policy. Compliance with these requirements of the law, which I shall mention in greater detail subsequently, will be facilitated by the combined administration of the two functions.

Twin Instruments of National Policy

The Military Assistance Program and Foreign Military Sales are twin instruments of that national policy. They complement each other as means by which the United States supports, strengthens and participates in free world collective security. Arms transfers represent a direct and significant contribution to the military posture of allied and friendly nations and regional defense organizations which is the substance of collective security. The armed forces we thus help to support represent an extension of our own defensive posture and a major deterrent to Communist aggression.

U.S. commitment to the principle and practice of collective security is manifest in the bilateral and multilateral collective security arrangement we have entered into with 43 countries throughout the Free World since World War II. Our membership in NATO, SEATO, ANZUS and the Rio Pact and, although we are not a signatory, our participation in the military planning activities of CENTO, also signal to both our friends and our potential enemies our determination to prevent further Communist aggression in any area of the Free World.

Although both grant aid and sales are instrumental in the development and maintenance of a credible collective defense, the contribution of MAP deserves special mention because it was this program which first checked further Communist expansion in Europe, and then went on to provide other threatened countries and areas with the means to protect themselves. The magnitude and importance of that contribution is reflected in the fact that no MAP recipient has been brought under the control of the USSR or the Peoples Republic of China, and only one former grantee, Cuba, is now a Communist country. Military assistance has also been a key factor in our relationships with nations in which we have bases and installations essential to optimum deployment of our own forces in support of U.S. global strategy.

Scope of Program

These are just a few of the ways in which the Military Assistance Program has promoted the security and foreign policy of the United States for 20 years by its support of the free world common defense effort. That support has taken the form of more than $34 billion worth of military equipment and related training—and associated costs—provided to a total of 78 allied and friendly countries. The materiel furnished included: $7.3 billion in vehicles and weapons, $6.5 billion in aircraft, and $4.2 billion in ammunition. Consider what, in fact, this expenditure has purchased in the form of forward defense.

Today, of course, the program bears little resemblance in size and scope to our initial grant aid undertaking for which the Congress appropriated almost $6 billion in FY 1952—almost 16 times our $375 million budget request for FY 1970. Increasing selectivity is another index of change. The number of recipient countries has been reduced from 69 in FY 1963 to 48 in FY 1969—and of those 48, only 25 are receiving materiel. Five of them alone—the forward defense countries of Greece, Turkey, Iran, and the Republics of China and Korea—account for approximately three-quarters of the total current year (1969) program.

Perhaps the best measure of both past MAP accomplishments and the on-going mutually beneficial interaction of grant aid and foreign military sales is the steady shift from the former to the latter, as earlier recipients become able to purchase the military equipment necessary to replace or augment the materiel given them by the United States in earlier years. It is interesting to note, however, that total military exports, both grant aid and sales, have stayed relatively consistent during the last 16 years, and that this stability will probably continue.

Grant aid programs for western European NATO nations from 1950 through FY 1967 totalled $12.3 billion. Sales orders placed by the same nine nations since 1962 amount to $6.2 billion—almost half the grant aid total. And, since the termination of grant aid to Japan in 1966, annual average Japanese acquisition of U.S. military equipment through co-production, commercial import and foreign military sales is running about $100 million.

Turning now to foreign military sales world-wide, I want to begin by recapitulating a few figures which I believe are significant, both as a record of past performance and as an indication of things to come:

- The United States has taken foreign military sales orders totaling $11.5 billion during the seven years ending in June 1968.
- Our long-standing estimate that actual sales would approximate $1 to $1.5 billion a year has been realized. Recent annual order total has somewhat exceeded $1.5 billion.
- The fact that a very high percentage of total sales orders to date have been placed by developed countries shoots down the uninformed, but unhappily persistent, claim that military purchases are jeopardizing economic progress and fomenting arms races among underdeveloped nations. Actually, Europe accounts for 74 percent of all sales orders since 1962, while only 1 percent is attributable to Africa and 2 percent to Latin America.
- If the so-called "oil rich" countries are included in the category of developed and industrialized nations, only 9 percent of total orders during the past seven years have come from the less developed countries. On a year-to-year basis, however, the portion coming from less developed countries is slowly increasing as the transition from grant to sales continues.
- It is also interesting to note that of the $11.5 billion total I mentioned earlier, 28 percent represented orders handled directly by U.S. firms, 48 percent orders handled on a government-to-government basis, and 24 percent on a credit basis. The latter were divided about half and half between the Export-Import Bank and private banking on the one hand, and Defense Department credit on the other.
- Finally, during the past seven years, the cash receipts coming from foreign military sales have covered just short of 50 percent of foreign exchange costs associated with the overseas deployment of U.S. forces in all areas except Southeast Asia.

Operation Under 1968 Act

The current fiscal year is the first year of operation under the Foreign Military Sales Act of 1968. Although it provides for a number of specific controls to be exercised by the Congress, we have always applied certain major restraints on foreign military sales. It is generally required that the military equipment being sold meet a valid military need. The recent decision of the Federal Republic of Germany to procure the Phantom aircraft meets a military requirement which is almost as important to the United States as it is to Germany. Many military exports, however, involve more complex criteria. These are all closely associated with the support of U.S. foreign policy, but they include specific considerations related to U.S. security, probable impact on arms races, questions of releasability of classified information, and extension of U.S. influence.

U.S. military exports must make good economic/financial/technological sense. They also encourage optimum

use of country resources, because they are designed to exert a restraining influence on the diversion of scarce resources to any military purchases for which there is no valid requirement. Financing sources and terms take into consideration both the ability of the country to pay and the ability of the United States to make credit available, on a basis which puts it to best use among many needs.

The typical potential sale involves all of these considerations and restraints and, often to the chagrin of international vice presidents of your member firms, many prospective sales end up on a "disapproved" list.

As I mentioned earlier, the Foreign Military Sales Act of 1968 contains a number of provisions which I believe are worth enumerating. This new separate sales legislation has:

- Abolished the so called "revolving fund"—establishing instead a requirement to obtain from the Congress each year such funds as are required to finance those military credit sales for which no other credit is available.
- Annulled the authority of the Defense Department to guarantee Export-Import Bank credit to the less developed countries.
- Placed a ceiling of $296 million on foreign military sales credit which may be extended during the current fiscal year. For FY 1970. we have proposed a credit sales program of $350 million based on a fund request for $275 million.
- Establishing new reporting requirements to the Congress covering past sales and estimates of future sales.

The Conte Amendment, paralleling a provision in the Foreign Assistance Act, restricts the sale of sophisticated weapons. It also adds the provision that no credit sales funds will be used to finance the sale of sophisticated weapons except for Greece, Turkey, Iran, Israel, the Philippines and the Republics of China and Korea unless the President finds such sale important to the security of the United States.

The Symington Amendment prohibits any sale to a less developed country which is diverting its own funds to excessive military expenditures, or diverting U.S. development assistance to any military expenditure.

The Ruess Amendment provides that there shall be no assistance given to countries whose military dictators deny social progress to their people.

Finally, the Pelly Amendment prohibits sales to a country which interferes with U.S. fishing vessels.

The Congress also established specific grant and foreign military sales ceilings for the FY 1969: $75 million for Latin America (excluding training) and $40 million for Africa (including training).

Administration of the Program

The new act also emphasized the responsibility of the Secretary of State to exercise supervision over U.S. military exports. While we have always operated in close coordination with and under the policy control of the Department of State, this emphasis in the act has led to a more comprehensive set of procedures to assure that there is absolutely no inadvertence in the management and control of foreign military sales.

The possibility of such inadvertence in administering either the Military Assistance Program or the Foreign Military Sales Program is minimized by a variety of other constraints and controls under which we operate. Each year's programs, including country sales estimates and MAP dollar ceilings for individual recipient countries, are subjected to extensive and repeated review and refinement throughout the Executive Branch before they are submitted to the Congress for legislative action. This is a never-ending cycle of considerable complexity.

To illustrate, let me trace just the major steps by which military assistance plans and programs, developed by the Military Assistance Advisory Groups (MAAGs) and Missions in the field, finally become deliveries of equipment and training. The review process begins with the Country Team and continues through the cognizant Unified Command to the Office of the Secretary of Defense, at which point the required coordination brings into the picture the Joint Chiefs of Staff, the Department of State and the Agency for International Development (AID), the Bureau of the Budget, the National Security Council—and, in some cases where Public Law 480 is involved, even the Department of Agriculture.

The final product of all this consultation and scrutiny is then reduced to writing in what we call Congressional Presentation Document (CPD), which is submitted to four committees of the Congress as narrative and statistical documentation of the President's annual budget request for MAP. These four committees—Senate Foreign Relations, House Affairs and the Foreign Operations Subcommittees of the Senate and House Appropriations Committees—hold often extensive and always penetrating hearings on our proposals and report their findings and recommendations to their parent bodies. Floor debate, conference and final legislative action follow; but the cycle is not complete, until the annual program is adjusted to conform to the amount appropriated and any new restrictions which may have been added during the legislative process. The end result is, I can assure you, a carefully controlled allocation of military assistance which allows little latitude for the sort of waste and mismanagement which critics of foreign aid delight in ascribing to us.

Foreign Military Sales are also, as I have indicated, subject to very strict control and repeated review by other elements of the Executive Branch and the Congress. Then, there is always the General Accounting Office watching over all our efforts in both the grant and sales portions of our operation.

One result of this continuing, comprehensive oversight of our activities is a substantial reduction in the number of personnel assigned to MAP and FMS duty with 45 MAAGs, missions, and five defense attaches, charged with responsibility for administering military assistance programs and facilitating sales arrangements in their respective host countries. We expect to reduce personnel strength in these overseas elements of our operation by 2,100 before July 1970, leaving about 5,000 total world-wide. This reduction will, of course, have a favorable impact on both our balance of payments and a tight military budget.

I hope to use the talents and contacts of the remaining 5,000 to the fullest possible extent in our Foreign Military Sales activities, and I consider it important that your overseas representatives work with or through them and their offices whenever they can.

(*Continued on Inside Back Cover*)

MEETINGS AND SYMPOSIA

JUNE

Fifth **Propulsion Joint Specialist** Conference (classified), June 9–13, at Colorado Springs, Colo. Sponsor: American Institute of Aeronautics and Astronautics. Contact: Meetings Department, American Institute of Aeronautics and Astronautics, 1290 Sixth Ave., New York, N.Y. 10019.

Federal Research and Development in the 70s—Its Need and Scope Symposium, June 11–12, West Auditorium, Department of State, 23rd St. between C and D Sts., NW, Washington, D.C. Sponsor: National Security Industrial Association. Contact: National Security Industrial Association, Dept. RD, 1030 15th St., NW, Suite 800, Washington, D.C. 20005. Phone (202) 296–2266.

Microcirculation in Perfused and Transplanted Organs and Organ Systems Conference, June 16–17, at University of Miami, Miami, Fla. Sponsors: Office of Naval Research and University of Miami. Contact: Dr. Theodore I. Malinin, Biochemical Research Laboratory, American Foundation for Biological Research, 11125 Rockville Pike, Rockville, Md. 20852. Phone (301) 946–1250.

Parallel Processor Systems Symposium, June 25–27, at Naval Postgraduate School, Monterey, Calif. Sponsors: Naval Weapons Center, Navy Postgraduate School, Hobbs, Associates, Inc., and the Office of Naval Research. Contact: Joel Trimble, Office of Naval Research, Code 437, Washington, D.C. 20360. Phone (202) 696–5038.

JULY

Sixth International **Physics of Electronics and Atomic Collision** Conference, July 27-Aug. 2, Massachusetts Institute of Technology, Cambridge, Mass. Sponsors: Air Force Office of Scientific Research, Massachusetts Institute of Technology, Office of Naval Research, National Science Foundation, International Union of Pure and Applied Sciences, and the Army Research Office, Durham, N.C. Contact: D.W. Wennersten, Air Force Office of Scientific Research (SRPP), 1400 Wilson Blvd., Arlington, Va. 22209, phone (202) OXford 4–5454; or Dr. Robert Mace, Director, Physics Division, U.S. Army Research Office-Durham, Box CM, Duke Station, Durham, N.C. 27706. Phone (919) 286–2285.

AUGUST

Fifth **Cryopreservation** Conference, August 7–9, at Buffalo, N.Y. Sponsor: Office of Naval Research. Contact: Lt. Cmdr. Vernon P. Perry, MSC, USN, National Naval Medical Center, Bethesda, Md. 20014. Phone (301) 295–1123.

International Conference on **Photoconductivity**, August 12–15, at Department of Materials Science, Stanford University, Stanford, Calif. Sponsors: Physics Branch, Office of Naval Research and Department of Materials Science, Stanford University. Contact: Prof. R.H. Bube, Local Arrangements Chairman, Department of Materials Science, Stanford University, Stanford, Calif. 94305. Phone (415) 321–2300.

International Conference on **Science of Superconductivity**, Aug. 25–28, Stanford University, Stanford, Calif. Sponsor: Air Force Office of Scientific Research. Contact: Lt. Col. R.A. Houidobre, Air Force Office of Scientific Research (SRPS), 1400 Wilson Blvd., Arlington, Va. 22209, phone (202) OXford 4–5588; or Prof. W.M. Fairbank, Stanford University, W. W. Hanson Laboratory of Physics, Stanford, Calif. Phone (415) 327–7800.

SEPTEMBER

Fourth annual **Society of Logistics Engineers** Convention, Sept. 9–10, at the Cape Kennedy Hilton Hotel, Cape Canaveral, Fla. Sponsor: Society of Logistics Engineers. Contact: George Dill, Publicity Chairman, Public Relations, M.U. 517, Aerospace Services Division, Pan American World Airways, Inc., Patrick AFB, Fla. 32925. Phone (303) 494–4844.

Navigation and Positioning Symposium and Advanced Planning Briefing for Industry (classified), September 23–25, Fort Monmouth, N.J. Sponsors: Army Electronics Command, Institute of Navigation and the Army Aviation Association of America. Contact: Col. James L. Burke, Special Assistant for Aviation and Aviation Electronics, Army Electronics Command, Fort Monmouth, N.J. 07703.

NEREM—69 Calls for Technical Papers for November Meeting

The New England section of the Institute of Electrical and Electronics Engineers has issued an invitation for papers for the 22nd Annual Northeast Electronics Research and Engineering Meeting (NEREM) to be held in Boston, Mass., November 5–7.

NEREM-69 will consider two types of papers: first, technical papers in engineering, research, or development, focusing on new and original work; second, technical application papers covering the use of components, circuits, instruments and hardware in military, industrial, or commercial equipment. Authors wishing to check suitability of their subjects may call the NEREM office, (617) 527–6944.

The deadline for both the abstract and condensed versions of the papers has been set at July 1, 1969, by NEREM-69. The address for submissions is: Program Chairman, IEE NEREM-69, 31 Channing St., Newton, Mass. 02158.

For further information on NEREM-69 contact Val Laughner Associates, Inc., 581 Boylston St., Boston, Mass. 02116. Phone (617) 267–3800.

ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Gen. Andrew J. Goodpaster, USA, designated to succeed Gen. Lyman L. Lemnitzer, USA, as Comamnder-in-Chief, U. S. European Command, and Supreme Allied Commander, Europe, formally assumed command of the U. S. European Command on May 5. Gen. Lemnitzer will remain as Supreme Commander, Europe, until he retires on July 1, at which time General Goodpaster will assume that command.

Richard A. Ware has been selected as Principal Dep. Asst. Secretary of Defense (International Security Affairs), succeeding Ralph Earle II, who will become Defense Advisor, U.S. NATO, in Brussels, Belgium.

Joseph J. Liebling, Dir. of Security Policy, Office of Asst. Secretary of Defense (Administration), is one of 10 recipients of the 1969 Career Service Award given by the National Civil Service League. The award recognizes Liebling's unique expertise in the security policy area. In his position, he serves as principal advisor to the Asst. Secretary for Administration with responsibility for policy planning, program guidance, and executive direction of security programs for both DOD organizations and defense contractors.

Brig. Gen. Henry J. Stehling, USAF, has been assigned as Dir., Real Property Maintenance Directorate, Office of Asst. Secretary of Defense, (Installations & Logistics).

Col. Daniel H. Callahan, USAF, (Brig. Gen. selectee), is the new Dir. of Production, Defense Contract Administration Services Region, Defense Supply Agency, O'Hare International Airport, Chicago, Ill.

Col. Benjamin W. Eakins, USAF, (Brig. Gen. selectee), has been named Chief, Financial Services Div., Contract Administration Directorate, Defense Contract Administrative Services, Defense Supply Agency, Cameron Station, Va.

Col. Willis M. Lake, USAF, (Brig. Gen. selectee), has been assigned Dir., Quality Assurance, Defense Contract Administration Service Region, Defense Supply Agency, Federal Office Building, Cleveland, Ohio.

Col. George L. Dalfries Jr., USAF, is the new Dep. Dir., Office of Legislative Affairs, Office of the Secretary of Defense.

Col. Robert E. Hamel, USAF, has been assigned as Dep. Project Manager, SATCOM Program Management, Defense Communications Agency.

Col. Robert R. Lochry, USAF, is Staff Officer, Office of Asst. Dir. (Space Technology), Office of the Dir. of Defense Research and Engineering.

Capt. William O. McLean, USN, has been assigned as Chairman, Joint Chiefs of Staff Special Study Group, Washington, D.C.

Capt. Gilbert S. Young, SC, USN, is the new Commander, Defense Contract Administration Services Region, Defense Supply Agency, Atlanta, Ga.

DEPARTMENT OF THE ARMY

Maj. Gen. Frederick J. Clarke has been nominated for lieutenant general to replace Lt. Gen. William F. Cassidy as Chief of Engineers. Maj. Gen. Clarke has been Dep. Chief of Engineers. Lt. Gen. Cassidy is retiring from active service.

The new Director of Maintenance at Headquarters, Army Materiel Command, Washington, D. C., is Brig. Gen. Arthur W. Kogstad.

Maj. Gen. Henry A. Rasmussen has been named Commanding General, U.S. Army Weapons Command, Rock Island, Ill. He replaces Maj. Gen. O. E. Hurlbut who was appointed as Army member of the Joint Chiefs of Staff Logistic Review Board.

Dr. William L. Archer has been appointed scientific advisor to the Institute of Land Combat, Fort Belvoir, Va. He is the former Dir., Combat Operations Research Group.

The U.S. Army Aviation Test Board has a new president, Col. Daniel G. Gust, who stepped up from deputy president.

Col. Joseph E. Halloran Jr., has been named Comptroller/Program Coordinator for the U.S. Army Combat Developments Command, Fort Belvoir, Va.

Col. Howard C. Metzler has taken command of the U.S. Army Aberdeen, Md., Research and Development Center.

DEPARTMENT OF THE NAVY

Capt. Douglas G. Aitken, SC, has been named Dep. Commander for Purchasing, Naval Supply System Command Headquarters, Washington, D.C.

Capt. Richeard J. Licko has been assigned to the Defense Weapon Systems Management Center, Wright-Patterson AFB, Ohio, as Asst. Dean.

DEPARTMENT OF THE AIR FORCE

Lt. Gen. Robert N. Smith replaces Lt. Gen. Robert J. Friedman as Chief of Staff, United Nations Command, Korea, and Chief of Staff, United States Forces, Korea. Lt. Gen. Friedman is now Vice Commander, Air Force Logistics Command, Wright-Patterson AFB, Ohio.

Maj. Gen. Pete C. Sianis is the new Dep. Chief of Staff, Materiel, for the Strategic Air Command, Offutt AFB, Neb.

Brig. Gen. Harmon E. Burns has moved from Asst. Dep. to Dep. Chief of Staff, Materiel, Air Training Command, Randolph AFB, Tex.

Col. Vernon R. Turner, Commander, Air Force Data Systems Design Center, Bolling AFB, Washington, D.C., has been appointed brigadier general.

Col. Thomas J. Cecil has been named Dir. of Systems Test, Air Force Flight Test Center, Edwards AFB, Calif.

Col. William R. Coleman has been assigned as A-7 systems support manager, Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

Col. Robert P. Fuqua has reported as Mission Dir., Test Operations, Space and Missiles Systems Office, (AFSC), Los Angeles, Calif.

Managing the Air Force's Ground Electronics Program

Brigadier General Franklin A. Nichols, USAF

Today's military environment, with its many faceted uses of global communications, has made the traditional concept of military communications as outdated as the carrier pigeon and the mule-drawn caisson.

This is particularly true of the Air Force. No longer can a "Wing and a Prayer" be the byword. Command control has taken its place.

Only through the use of precise, reliable electronics is command and control possible. It is not that the computer and the scanner have taken over—they are simply a necessary adjunct to the men and women who carry out the increasingly complex mission of the Air Force.

This burgeoning future of communications-electronics-meteorological (CEM) requirements was recognized by the Air Force in the late 1950s, when it created the Ground Electronics Engineering Installation Agency (GEEIA). The engineering and installation capabilities of 27 organizations in 7 different commands were consolidated to form the agency, and it became a part of the Air Force Logistics Command (AFLC). AFLC added on-site depot level maintenance responsibilities to GEEIA's mission in 1964.

The current Air Force inventory of about $8 billion worth of fixed ground CEM equipment, with an add-on of more than $500 million annually, testifies to the wisdom of the decision to establish GEEIA.

Within the organizational structure of AFLC, GEEIA has the same status as AFLC's air materiel areas (AMAs). It is headquartered at Griffiss AFB, N. Y., and has a global operating responsibility made up of 5 regions and 16 squadrons strategically deployed throughout the Free World. Nineteen Air National Guard squadrons, with some 3,400 men, also are assigned for mobilization and training.

GEEIA's customers include each major air command, separate operating agency and Air Force installation. At any given time, the engineers or their installation and mobile maintenance teammates are at work at any one of over 400 sites around the world.

GEEIA Management System

By necessity, management must be the first order of importance. A system known as the GEEIA Management System (GEMS) reflects every job that GEEIA is currently working on or has programmed, providing computerized information tailored to the agency's specific needs. This includes data from the outset of the requirement to the wrap-up of the physical installation, and any necessary follow-on depot level maintenance.

GEMS contains separate subsystems which handle the requirements of each management area. Data from each subsystem feed into a common data storage bank which produces composite reports that portray the total picture of resource requirements and utilization, plus the current status of workload. This system is continually reworked, revitalized and updated.

Data obtained from GEMS are analyzed and evaluated. Results of each preceding month's operation are presented to the commander and appropriate staff officers in the form of a monthly management review. Each region's performance is compared with its sister regions and with established standards for each topic. Subjects evaluated range from administrative support areas, upgrading on-the-job training, job order status and completions to specific world-wide problems.

This GEMS data and monthly management review are published as the "Management Analysis Digest," a composite, easy-to-handle document that each commander and staff member can refer to at all times.

The performance yardsticks include such broad areas as mission operations (CEM support in terms of engineering-installation and mobile depot maintenance accomplishments); number of jobs, slippages in Facility Support Dates (FSD), delinquencies in FSD's plant-in-place records; safety; training; finance; administration and on-the-job training.

Brigadier General Franklin A. Nichols, USAF, is Commander of the Air Force's Ground Electronics Engineering Installation Agency. Prior to assuming this command, he served as Chief of Staff, Seventh Air Force, in Vietnam; and before that commanded the 833rd Air Division. General Nichols is a graduate of Washington and Lee University, and also has attended the Armed Forces Staff College, Naval War College, and completed Parachute Jump Training at Fort Benning, Ga.

A member of GEEIA's 2874th Squadron, Ramstein, Germany, works on the billboard for the 486L project.

Command Control of Problems

To handle unanticipated resource management problems on specific jobs, GEEIA established a command control room. Here, the daily status of GEEIA's maintenance and installation workload and work force is maintained.

The information from the computer is manually displayed with daily updating. Where are the teams? What are the compositions, both numbers and skill-wise? What are their problems? How can GEEIA headquarters assist the region or squadron?

Each region is shown as a whole. How many jobs is it working on? Are any in trouble? How many are delinquent or forecast to be delinquent? What is the utilization rate—number of people assigned, available, in training, on leave? In short, what is the personnel impact of a top-priority project?

With one region reviewed daily, the entire organization is covered on a weekly basis. Each effort is reviewed from all angles. Is material needed? Is the allied construction at fault? Are additional personnel from other regions needed to augment the basic team? Is a multiple shift operation required?

Through these means, GEEIA has developed an optimum balance between exception reporting, where applicable, while maintaining positive control on each and every job. Each region and squadron maintains a control board displaying the same data on its participation efforts as is displayed at the master control center in the Griffiss headquarters.

A virtual real-time status of the installation and maintenance problems between GEEIA headquarters and its overseas regions is made possible by using a telex machine as an integral part of the control room. The Pacific Region also has direct telex access to its squadrons in the Philippines and Japan.

This management-information seeking activity has been extended to include those jobs that have been totally supplied in the field, but not yet started. In other words, all the equipment involved in the installation is there, but the installation has not yet begun.

Those problems which are beyond GEEIA's control, such as delays in allied construction or changes in the using command's requirements, are pinpointed and brought to the attention of the organization concerned. Similar information is forecast for succeeding quarters of the year so that preventive action may be taken before it becomes a problem.

In addition, periodic meetings with major command GEEIA customers, and a GEEIA Management Performance System, among others, are used to keep an accurate pulse of the agency's performance.

From January to December 1968, GEEIA reduced delinquent jobs from over 2,000 to 970. The delinquent jobs in Southeast Asia are down from a high of over 300 to just over 80—a decrease in the rate of delinquency from over 20 percent to a low of 8 percent. In the maintenance area, the delinquent jobs dropped from 250 to 50. Along with the overall reduction in delinquencies, GEEIA's production, measured by jobs completed, increased more than 30 percent in the past year.

Consolidation of Systems Engineering Efforts

To further improve responsiveness and efficiency, systems engineering efforts are being consolidated at Headquarters, GEEIA.

In the past, each major command dealt with the individual GEEIA re-

gion on many of its long-range CEM program requirements. By consolidating the pre-CEIP (Communications Electronics Implementation Plan) systems engineering responsibility in its headquarters at Griffiss AFB, GEEIA will have the perspective to evaluate total requirements. The customer will receive more responsive support through more detailed and realistic GEEIA programming. Some 8 to 10 requests a week come in from the various using commands for help in pre-CEIP efforts. This benefits both GEEIA and the requestor in several ways.

First, the specifications and equipments are put into the CEIP in such a manner that it is not rejected by Air Force for faulty format, imprecise specification, or erroneous details. Second, resources can be programmed by GEEIA more adequately to do the job, when it appears on the PCSP (Programmed Communications Support Program) issued by the CEM division of AFLC's Deputy Chief of Staff for Operations. Third, the customer and the Air Force, as a whole, benefit by having the command and control facility engineered, installed and working on a timely schedule. Timeliness is considered so important that once a task is accepted and programmed, GEEIA's Forecast Support Date can be delayed or changed only upon approval of the agency's commander. Such a decision is not delegated to any lower level in the organization.

Other actions have been taken to improve customer support capability:

- **Standardization of organizations, functions and operating procedures in all regions.** These activities, in conjunction with a completely automated GEEIA management system, insure effective management control of GEEIA resources world-wide and allow rapid response in support of emergency and high-priority GEM requirements anywhere in the world.

- **Continual self appraisal of capability, workload and resources.** This permits realignment of types and locations of skills to be most responsive to users' needs.

- **Development of manning criteria and direct labor formulas.** Proper distribution and utilization of manpower resources for long-range workload planning is recognized as a key aspect in successful job performance.

- **Long-range forecasting of CEM workload through the U. S. Air Force Command Control and Communications Program.** This program is extremely important to GEEIA since it includes the bulk of the communications-electronics program within the Air Force. It is an extension of the Air Force and DOD programming systems, and entails an annual program project spanning an eight-year period. GEEIA is working closely with each major command to insure that ground CEM requirements of the command are included in the annual communications - electronics submission. Only if the major commands prepare this document properly and on a timely basis can GEEIA effectively forecast workload and resource requirements to support its many customers. As an additional byproduct, skill distribution can be be adjusted to accomplish projected workload.

- **Quarterly reviews attended by GEEIA representatives, plus meetings with CEM Boards of the major commands.** These provide an avenue for exchange of advanced information on what the future requirements will be, and give GEEIA an extra break to assure that jobs are completed on time.

- **Dialogue with primary users and suppliers.** Regular meetings are scheduled between GEEIA and the Air Force Communications Service, U. S. Air Force Security Services, the Air Force Systems Command's Electronic Systems Division, and the Air Force Logistics Command's Oklahoma Air Materiel Area. These meetings provide an opportunity for face-to-face sessions between some of the biggest users of GEEIA's service and the primary suppliers of the equipment. Potential problem areas are resolved before they actually arise. During the past year, these meetings can be credited with providing the proper atmosphere that reduced many of the problems which have traditionally plagued GEEIA efforts in the ground CEM environment.

Through management improvement techniques and the efforts of each member—from the installers in the Vietnam jungles to the engineers in headquarters and the regions—GEEIA has become truly a "can do" outfit, getting the job done on time and in a quality manner wherever it is called upon to do it. These efforts have provided the Air Force the ground communications-electronics-meteorological environment to carry out its mission to "fly and fight" in the increasingly complex milieu, where the F–4 and the satellite operate in place of the carrier pigeon and mule-drawn caisson.

Two members of the 2862nd GEEIA Squadron work on an "AK" building in support of the Navy's Poseidon Program, Cape Kennedy AFS, Fla.

DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of April 1969.

DEFENSE SUPPLY AGENCY

1—**Trenton Textile Engineering and Manufacturing Co., Inc.,** Trenton, N.J. $1,492,929. 199,323 wet weather parkas. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1867.

—**Texaco Inc.,** New York, N.Y. $3,764,739. 24,612,600 gallons of automotive gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-1271.

—GAS Corp., New York, N.Y. $1,640,905. 83,480 packages of radiographic film. Defense Personnel Support Center, Philadelphia, Pa. DSA 120-69-C-4262.

—**Trenton Textile Engineering and Manufacturing Co.,** Trenton, N.J. $1,029,452. 124,180 men's wet weather coated overalls. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1882.

4—**So-Sew Styles, Inc.,** Centre, Ala. $1,157,089. 153,664 men's blue wool flannel jumpers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1910.

—**J. P. Stevens and Co., Inc.,** New York, N.Y. $1,456,447. 2,750,000 yards of sateen cotton cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1887.

—**Riegel Textile Corp.,** New York, N.Y. $6,916,636. 2,200,000 yards of sateen cotton cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1888.

—**Burley Processing Co.,** Burley, Idaho. $1,221,926. 262,080 cases of dehydrated potatoe slices. Defense Personnel Support Center, Philadelphia, Pa. DSA 137-69-C-CC31.

7—**Consolidated Bag Corp.,** Philadelphia, Pa. $2,816,811. 10,200,000 acryllic sand bags. Defense General Supply Center, Richmond, Va. DSA 400-69-C-4685.

—**Dowling Bag Co.,** Valdosta, Ga. $1,044,255. 3,750,000 acryllic sand bags. Defense General Supply Center, Richmond, Va. DSA 400-69-C-4686.

—**Cavalier Bag Co., Inc.,** Lumberton, N.C. $3,607,214. 13,000,000 acryllic sand bags. Defense General Supply Center, Richmond, Va. DSA 400-69-C-4686.

—**Star-Kist Foods, Inc.,** Terminal Island, Calif. $1,008,347. 56,576 cases of canned tuna. Defense Personnel Support Center, Philadelphia, Pa. DSA 134-69-C-0825.

—**Milcom Products, Inc.,** Rochester, N.Y. $1,459,357. 105,020 body armor fragmentation protective vests. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1785.

—**Trenton Textiles Engineering Manufacturing Co., Inc.,** Trenton, N.J. $1,136,520. 82,000 body armor fragmentation protective vests. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1784.

8—**Stone Manufacturing Co.,** Columbia, S.C. $1,018,282. 2,200,839 pairs men's thigh length cotton drawers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1954.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company — Value — Material or Work to be Performed—Location of Work Performed (if other than company plant) — Contracting Agency—Contract Number.

9—**Inflated Products Co., Inc.,** Beacon, N.Y. $3,113,815. 466,140 pneumatic mattresses. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1965.

—**Bannercraft Clothing Co., Inc.,** Philadelphia, Pa. $1,719,550. 85,000 men's wool serge coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1947.

—**Tursini and Co.,** Vineland, N.J. $1,174,513. 65,070 men's wool serge coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1948.

—**Dale Fashions, Inc.,** Vineland, N.J. $2,519,972. 127,400 men's wool serge coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1946.

10—**Michael, Inc.,** Philadelphia, Pa. $1,119,000. 50,000 men's green wool serge coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1941.

—**Albert Turner Co., Inc.,** New York, N.Y. $1,106,000. 50,000 men's green wool serge coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1942.

11—**Burlington Industries, Inc.,** New York, N.Y. $3,324,330. 859,000 linear yards of wool serge cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1995.

—**Southern Worsted Mills, Inc.,** Boston, Mass. $1,847,000. 500,000 linear yards of wool serge cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1994.

—**Burlington Industries, Inc.,** New York, N.Y. $1,836,000. 400,000 linear yards of wool garbardine cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1996.

—**J. P. Stevens and Co., Inc.,** New York, N.Y. $1,050,400. 232,000 linear yards of wool gabardine cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1997.

14—**Marmac Industries, Inc.,** Marysville, Mich. $1,231,697. 511,290 helmet liners. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-2004.

—**International Harvester Co.,** Melrose Park, Ill. $1,336,129. 38 various size full-tracked tractors. Defense Construction Supply Center, Columbus, Ohio. DSA 700-69-C-9471.

17—**Westinghouse Air Brake Co.,** Peoria, Ill. $1,186,000. 69 earthmoving scrapers. Poccoa, Ga. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-C-9823 Mod P002.

18—**Milcom, Inc.,** Rochester, N.Y. $1,102,585. 811,760 cotton duck belts. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-2038.

22—**Tennessee Overall Co., Inc.,** Tullahoma, Tenn. $1,353,631. 576,560 pairs of men's polyester wool tropical trousers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-2071.

23—**Foster Industries, Inc.,** New York N.Y. $1,263,654. 416,710 men's tricot knit nylon triacetate sleeping shirts. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-2076.

24—**Pettibone Mulliken Corp.,** Washington, D.C. $5,647,933. 149 rough terrain forklift trucks of 10,000 pound capacity. Defense General Supply Center, Richmond, Va. DSA 400-69-C-5415.

25—**Sinclair Oil Corp.,** New York, N.Y. $2,615,891. 22,600 gallons premium gasoline, 9,916,900 gallons regular gasoline, 701,800 gallons kerosene, 2,797,000 gallons diesel fuels and 6,171,500 gallons fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-1263.

—**Murphy Oil Corp.,** El Dorado, Ark. $1,050,272. 3,750,000 gallons regular gasoline, 3,520,000 gallons diesel fuel and 1,475,000 gallons fuel oils. Defense Fuel Supply Center, Alexandria, Va. DSA 600-69-D-1256.

—Raymer Bag Corp., New Bedford, Mass. $1,946,913. 7,050,000 acrylic sandbags. Defense General Supply Center, Richmond, Va. DSA 400-69-C-5696.

—**Inflated Products Co., Inc.,** Beacon, N.Y. $1,001,064. 149,860 nylon pneumatic mattresses. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-1965.

28—**Rachman Manufacturing Co.,** Reading, Pa. $1,284,852. 104,290 fragmentation protective body armor vests. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-C-2061.

29—**M.L.W. Corp.,** Bayamon, Puerto Rico, $2,430,000. 1,000,000 pairs of men's windresistant cotton trousers. Defense Personnel Support Center Philadelphia, Pa. DSA 100-69-C-2149.

30—**U&W Manufacturing Co., Inc.,** Selma, Ala. $1,322,457. 919,500 pairs of men's cotton sateen trousers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100-69-B-2162.

DEPARTMENT OF THE ARMY

1—**Olin Mathieson Chemical Corp.,** East Alton Ill. $7,948,880. 7.62mm NATO ball cartridges (M80) and M62 linked tracers. DA-AA25-69-C-0089. $2,354,419. 5.56mm tracer cartridges (M196). DA-AA25-69-C-0086. $10,151,736. Clipped 7.62mm NATO ball cartridges. DA-AA25-69-C-0090. Work will be done at New Haven, Conn., and East Alton, Ill. Frankford Arsenal, Philadelphia, Pa.

—**Remington Arms Company, Inc.,** Bridgeport, Conn. $6,796,473. 7.62mm NATO ball and tracer cartridges (M80 and M62). Frankford Arsenal, Philadelphia, Pa. DA-AA25-69-C-0088.

—**Bulova Watch Co.,** Jackson Heights, N.Y. $2,365,398. Metal parts for point detonating fuzes for 81mm projectiles (M374). West Valley Spring, N.Y. Cincinnati, Ohio, Procurement Agency. DA-AA09-69-C-0256.

—**John R. Hollingsworth Co.,** Phoenixville, Pa. $1,268,594 (contract modification). 3 KW, 28-volt generator sets. Army Mobility Equipment Command, St. Louis, Mo. DA-AK01-68-C-1573.

—**General Electric Co.,** Syracuse, N.Y. $5,519,262. AN/MPQ-4A radar sets. Syracuse, N.Y., and Pittsfield, Mass. Army Electronics Command, Philadelphia Procurement Division, Philadelphia, Pa. DA-AB05-69-C-0417.

—**Hesse-Eastern Div., Norris Industries, Inc.,** Brockton, Mass. $9,263,666. 66mm rocket launchers. New York Procurement Agency, N.Y. DA-AA09-69-C-0085.

—**Magnavox Co.,** Urbana, Ill. $3,803,604. AN/ARC-131 VHF-FM radio sets. Procurement Division, Army Electronics Command, Fort Monmouth, N.J. AF-34-601-68-A1489.

—**P.R.D. Electronics, Inc.,** Westbury, L.I., N.Y. $3,133,157 (contract modification). AN/USM-234 microwave sets. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-1992.

—**Construction, Ltd.,** Bordentown, N.J. $1,561,300. Modification of three buildings, Fort Meade, Md. Baltimore Engineer District. DA-CA31-69-C-0068.

—**Texas Instruments, Inc.,** Dallas, Tex. $6,800,000. Infra-red detecting sets, AN/AA5-24, and test equipment. Army Electronics Command Procurement Division,

Fort Monmouth, N.J. DA-AB07-69-C-0257.

—**Collins Radio Co.,** Richardson, Tex. $1,909,812. AN/TRC-132A radio terminal sets. Chicago Procurement Agency. DA-AB07-67-C-0181.

—**Continental Motors Corp.,** Mobile, Ala. $1,175,428 (contract modification). Overhaul of LDS 427-2 multi-fuel engines for 2½-ton trucks. Brookley AFB, Ala. Army Tank Automotive Command, Warren, Mich. DA-AE07-68-C-2001.

—**FMC Corp.,** Charleston, W. Va. $1,500,000. M548 cargo carriers with material handling kits and personnel heaters. Army Tank Automotive Command, Warren, Mich. DA-AE07-69-C-0751.

—**J. R. Youngdale Construction Co., Inc.,** and **E. W. Johnson,** San Diego, Calif. $1,419,300. Construction of maintenance dock for aircraft fueling system, Altus AFB, Okla. Albuquerque, N. M., Engineer District. DA-CA47-69-C-0075.

—**Kasch Brothers, Inc.,** Big Springs, Tex. $2,010,500. Construction of a composite medical facility at Keese AFB, Texas. Albuquerque Engineer District. DA-CA47-69-C-0086.

—**Kasch Brothers, Inc.,** Big Springs, Tex. $1,958,500. Construction of composite medical facility, Webb AFB, Texas. Albquerque Engineer District. DA-CA47-69-C-0087.

—**General Motors Corp.,** Detroit, Mich. $2,003,503 (contract modification). 100 KW, 60-cycle generator sets. Mobility Equipment Command. DA-AK01-68-C-6220.

—**Harnischfeger Corp.,** Milwaukee, Wis. $4,998,000 (contract modification). 20-ton truck mounted cranes. Escanaba, Mich. Mobility Equipment Command. DA-AK01-69-C-7411.

—**Varo, Inc.,** Garland, Tex. $1,420,000. Shoulder operated, 40mm grenade launchers (M79). Mexia, Texas. Army Weapons Command, Rock Island, Ill. DA-AF03-69-C-0077.

—**Ametek, Inc.,** Sheboygan, Wis. $1,226,172 (contract modification). Support assemblies for ammunition fiber containers (M105A2). Plymouth, Wisc. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA-9-67-C-0122.

2—**Raytheon Co.,** Andover, Mass. $8,688,150 (contract modification). Engineering services for improved Hawk missile system and value engineering program requirements. Andover, Mass., and Bedford, Mass. Army Missile Command, Huntsville, Ala. DA-AH01-60-C-0099.

3—**Umbqua River Navigation Co.,** Reedsport, Ore. $4,044,400. Construction of south jetty on the Pillamook Bay and Bar, Oregon, Project. Portland, Ore., Engineer District. DA-CW57-69-C-0091.

4—**Algernon Blair, Inc.,** Montgomery, Ala. $12,855,300. Construction of nine enlisted men barrack complexes, including dental clinic, two gynasiums, supporting utilities and site work. Fort Bragg, N.C. Savannah, Ga., Engineer District. DA-CA21-69-C-0087.

—**Whirlpool Corp.,** Evansville, Ind. $1,890,434. 152mm canister (XM626) fabrication and assembly. Picatinny Arsenal, Dover, N.J. DA-AA21-69-C-0363.

—**Northrop Corp.,** Anaheim, Calif. $2,292,916. Fabrication and assembly of 152mm canisters (XM626). Picatinny Arsenal, Dover, N.J. DA-AA21-69-C-0362.

—**I. D. Precision Components Corp.,** Jamaica, N.Y. $1,099,132. Metal parts for point detonating fuzes (M524A5) for 81mm mortars. Gadsden, Ala., and Jamaica, N.Y. New York, N.Y., Procurement Agency. DA-AA09-69-C-0301.

—**Colt's Inc.,** Hartford, Conn. $2,205,000 (contract modification). 20-round magazine assemblies for M16 weapons. Army Weapons Command, Rock Island, Ill. DA-AF03-69-C-0007.

7—**Airport Machining Corp.,** Martin, Tenn. $3,093,750 (contract modification). Metal parts for 2.75 inch rocket warheads. Union City, Tenn. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0087.

—**R.E.D.M. Corp.,** Wayne, N.J. $1,287,000. Metal parts for 81mm cartridge mortar fuzes. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0281.

8—**Hayes International Corp.,** Birmingham, Ala. $1,155,056 (contract modification). Metal parts for 2.75 inch rocket warheads. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0135.

9—**Hamilton Watch Co., Lancaster,** Pa. $9,118,005. Mechanical time fuzes for artillery shells. East Petersburg, Pa. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0252.

—**Riverside Research Institute,** New York, N.Y. $1,599,000. ARPA developed Advanced Measurements Radar operation and maintenance, and processing data for missile in-flight data. White Sands Missile Range, White Sands, N.M. DA-AD07-69-C-0035.

10—**Western Electric Co.,** New York, N.Y. $1,327,070 (contract modification). Additional research and development on Safeguard Ballistic Missile System. Santa Monica, Calif., and Whippany, N.J. DA-30-069-AMC-00333(Y).

11—**Ralph M. Parsons Co.,** Los Angeles, Calif. $1,876,667 (contract modification). Architect engineer services in development or criteria for tactical structures for Missile Support Radars in the Safeguard Defense System. Army Engineer Division, Huntsville, Ala. DA-CA01-67-C-0010.

—**Nabholtz Construction Corp.,** Conway, Ark. $1,500,300. Construction of a loading and assembly facility at Pinebluff Arsenal, Ark. Army Engineer District, Fort Worth, Tex. DA-CA62-69-C-0135.

—**Lockheed Electronics Co.,** Plainfield, N.J. $1,370,700. AN/VPS-2 radar systems for the Vulcan Air Defense System. Army Procurement Agency, New York, N.Y. DA-AA25-68-C-0718.

—**FMC Corp.,** San Jose, Calif. $1,039,000. Conversion kits for converting M113A1 armored personnel carriers to recovery vehicles. San Francisco Army Procurement Agency, Oakland, Calif. DA-AG05-69-C-0600.

14—**Domenic Leone Construction Co., Inc.,** Trinidad, Colo. $1,039,500. Construction of access roads for new range facility, Fort Carson, Colo. Omaha, Neb., Engineer District. DA-CA45-69-C-0073.

—**Electro-Mechanical Corp.,** Sayre, Pa. $1,153,733. Electrical equipment shelters. Binghamton, N.Y. Procurements Division, Army Electronics Command, Philadelphia, Pa. DA-AB05-69-C-0126.

15—**Ford Motor Co.,** Highland Park, Mich. $2,837,189 (contract modification). ¼-ton utility trucks (M151A1). Project Manager, General Purpose Vehicles, Warren, Mich. DA AE-06-68-C-0001.

—**Atlas Chemical Industries, Inc.,** Wilmington, Del. $2,334,953 (contract modification). Manufacture of TNT and related material. Volunteer Army Ammunition Plant, Chattanooga, Tenn. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-11-173-AMC-531(A).

16—**Martin Marietta Corp.,** Orlando, Fla. $2,386,750. Advanced development models of the random access discreet address (RADA) communication system. Army Electronics Command, Fort Monmouth, N.J. DA-AB07-69-C-0231.

—**Dynalectron Corp.,** Fort Worth, Tex. $3,407,531. Maintenance on quarry and highway construction equipment in Vietnam. Army Mobility Equipment Command, St. Louis, Mo. DA-AK01-69-A-2425(D4).

17—**Olin Mathieson Chemical Corp.,** New York, N.Y. $2,156,342 (contract modification). Production of various propellants and support activities at the Badger Army Ammunition Plant, Baraboo, Wis. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0014.

—**Continental Motors Corp.,** Muskegon, Mich. $4,853,297 (contract modification). AVDS 1790-2A engines for M60 tank. Army Tank Automotive Center, Warren, Mich. DA-AE07-69-C-0534.

—**KDI Precision Products, Inc.,** Cincinnati, Ohio. $1,422,150 (contract modification). Point detonating fuzes for 2.75 inch rockets. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0196.

—**Amron Corp.,** Waukesha, Wis. $2,244,874. Metal parts for M43A1 grenades. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0395.

—**Wevmouth-Fordice,** Memphis, Tenn. $1,486,300. 150,000 squares of cast articulated concrete mattresses for revetments for the Flood Control Mississippi River and Tributaries Project, St. Francisville, La. New Orleans Engineer District. DA-CW29-69-C-0136.

—**Radio Corporation of America,** Burlington, Mass. $5,236,359. Refurbishing and updating Land Combat Support System demonstration and service test models. Army Missile Command, Huntsville, Ala. DA-AH01-69-C-1437.

18—**Physics International Co.,** San Leandro, Calif. $1,198,733 (contract modification). Construction of a high voltage generator for a gamma ray simulation facility. Defense Atomic Support Agency, Washington, D.C. DA-SA01-68-C-0175.

21—**Remington Arms Co.,** Bridgeport, Conn. $14,455,058 (contract modification). Operation and maintenance of Lake City Ammunition Plant, Independence, Mo. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-49-010-AMC-00003(A).

—**Day and Zimmermann Co.,** Philadelphia, Pa. $13,028,968 (contract modification). Load, assemble and pack artillery ammunition and components. Lone Star Army Ammunition Plant, Texarkana, Tex. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-11-173-AMC-00114(A).

—**Federal Cartridge Corp.,** Minneapolis, Minn. $8,375,506 (contract modification). Load, assemble and pack 7.62mm and 5.56mm ball and tracer ammunition. Twin Cities Army Ammunition Plant, New Brighton, Minn. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-36-038-AMC-1099(A).

—**National Union Electrical Corp.,** Bloomington, Ill. $6,372,450 (contract modification). Metal parts for 750-lb. bomb nose fuzes. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0068.

—**Raytheon Co.,** Lexington, Mass. $2,956,500 (contract modification). Metal parts for 750-lb. bomb nose fuzes. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0070.

—**Batesville Manufacturing Co.,** Batesville, Ark. $2,408,700 (contract modification). Metal parts for 750-lb. bomb nose fuzes. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0069.

—**Scovill Manufacturing Co.,** Waterbury, Conn. $1,531,914 (contract modification). Cluster bomb fuzes. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0141.

—**Silas Mason Co., Inc.,** New York, N.Y. $1,113,324 (contract modification). Load, assemble and pack bombs, mines and selected ammunition. Cornhusker Army Ammunition Plant, Grand Island, Neb. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-68-C-0383.

—**Western Electric Co., Inc.,** New York, N.Y. $2,485,350. Nike Hercules improved kits. Burlington, N.C. Army Missile Command, Redstone Arsenal, Huntsville, Ala. DA-AH01-68-A-0041.

—**Firestone Tire and Rubber Co.,** Akron, Ohio. $2,248,322 (contract modification). Shoe assemblies for combat tank tracks. Noblesville, Ind. Tank Automotive Command, Warren, Mich. DA-AE07-69-C-2209.

—**General Motors Corp.,** Anderson, Ind. $1,095,135 (contract modification). 12 volt storage batteries for general application. Anaheim, Calif. Tank Automotive Command, Warren, Mich. DA-AE07-69-C-1946.

—**AVCO Corp.,** Stratford, Conn. $1,000,160 (contract modification). Gas turbine engines for OV-1 Mohawk aircraft. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-1874.

22—**TRW, Inc.,** Cleveland, Ohio. $1,927,080. Bolt and roller assemblies for M14 rifles. Army Weapons Command, Rock Island Arsenal, Ill. DA-AF01-68-C-0608.

—**Brunswick Corp.,** Sugar Grove, Va. $1,459,901. XM202 launchers and XM 74 rocket clips. Edgewood Arsenal, Dover, Del. DA-AA15-69-C-0599.

23—**Hayes Albion Corp.,** Albion, Mich. $2,006,400. Metal parts for 2.75 inch rocket warheads. Hillsdale, Mich. Army Procurement Agency, Cincinnati, Ohio. DA-AA09-69-C-0332.

24—**IBM Corp.,** Owego, N.Y. $5,500,000. Classified electronic work. Army Electronics Command, Fort Monmouth, N.J.

—**AVCO Corp.,** Stratford, Conn. $1,309,112. Conversion kits for T-55-7C turbine engines for CH-47 helicopters. Army Aviation Materiel Command, St. Louis, Mo. AF 41-608-69-A2421.

—**Bell Helicopter Co.,** Ft. Worth, Tex. $1,325,060. Main rotor hub assemblies for AH-1G helicopters. Hurst, Tex. Army

Aviation Materiel Command, St. Louis, Mo. DA–AJ01–69–A–0314.

25—**Raytheon Co.**, Lexington, Mass. $3,217,500 (contract modification). Metal parts for 750-pound bomb tail fuzes. Bristol, Tenn. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA–AA09–69–C–0073.

—**Raytheon Co.**, Andover, Mass. $2,364,998. Various quantities of self-propelled Hawk ground support equipment. Army Missile Command, Redstone Arsenal, Huntsville, Ala. DA–AH01–69–C–1388.

—**Maremont Corp.**, Saco, Maine. $1,699,125 (contract modification). M60, 7.62mm machine guns. Army Weapons Command, Rock Island, Ill. DA–AF03–69–C–0050.

—**Pace Corp.**, Memphis, Tenn. $1,467,686 (contract modification). Illuminating parachute signals. Memphis, Tenn., and Camden, Ark. Picatinny Arsenal, Dover, N.J. DA–AA21–68–C–1102.

—**Ralph M. Parsons Co.**, Los Angeles, Calif. $1,297,751 (contract modification). Continuing engineering service in support of design of the Missile Site Radar in the Safeguard Missile System. Engineer Division, Huntsville, Ala. DA–CA87–68–C–0001.

—**Bowen-McLaughlin-York**, Blair, Pa. $1,157,390. Belly armour installation kits for the M113 family of vehicles. Army Tank Automotive Center, Warren, Mich. DA–AE07–69–C–4373.

—**Bell Helicopter Co.**, Ft. Worth, Tex. $1,144,275. Tail rotor blades for UH–1 helicopters. Hurst, Tex. Army Aviation Materiel Command, St. Louis, Mo. DA–AJ01–69–A–0314.

28—**Norris Industries, Inc.**, Los Angeles, Calif. $2,500,959. Metal parts for 81mm high explosive projectiles. Army Ammunition Plant, Riverbank, Calif. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA–AA09–69–C–0290.

—**Kaiser Steel Corp.**, El Monte, Calif. $2,199,120 (contract modification). Metal ammunition box assemblies (M2A1). Linde Industries, Culver City, Calif. Frankford Arsenal, Philadelphia, Pa. DA–AA25–69–C–0186.

—**Continental Motors Corp.**, Muskegon, Mich. $1,721,100. Cylinder assemblies for M60 tank. Muskegon, Mich., and Oberdorker Foundries, Inc., Syracuse, N.Y. Army Tank Automotive Center, Warren, Mich. DA–AE07–69–C–2775.

—**General Motors Corp.**, Cleveland, Ohio. $3,784,000 (contract modification). Interim phase advanced production engineering on the XM70 Main Battle Tank. Cleveland and Milwaukee, Wis. Army Tank Automotive Center, Warren, Mich. DA–AE07–68–C–3097.

—**Philco Ford Corp.**, Newport Beach, Calif. $1,995,515. Analysis, design specification and development of a platform sensor system. Safeguard System Command, Huntsville, Ala. DA–HC60–69–C–0085.

29—**Clark Equipment Co.**, Battle Creek, Mich. $1,003,528. Rough terrain fork lift trucks. Army Mobility Equipment Command, St. Louis, Mo. DA–AK01–69–C–7793.

—**United Aircraft Corp.**, Stratford, Conn. $21,975,000. CH–54B (TARHE) helicopters with engine particle separators and armor data. Army Aviation Materiel Command, St. Louis, Mo. DA–AJ01–68–C–0827.

—**Page Communications Engineers, Inc.**, Sierra Vista, Ariz. $2,858,331. Operation and maintenance of the integrated wide band communication system (IWCS) in Thailand. Army Procurement Division, Fort Huachuca, Ariz. DA–AE18–69–C–0155.

—**Page Communications Engineers, Inc.**, Sierra Vista, Ariz. $4,276,331. Operation and maintenance of IWCS sites in Vietnam. Army Procurement Division, Fort Huachuca, Ariz. DA–EA18–69–C–0154.

—**Uniroyal, Inc.**, New York, N.Y. $2,444,536 (contract modification). Manufacture of explosives, and loading, assembling and packing ammunition at the Army Ammunition Plant, Joliet, Ill. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA–11–173–AMC–62(A).

—**Kilby Steel Co.**, Anniston, Ala. $2,060,329. Body assemblies and base plugs for 8-inch high explosive projectiles. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA–AA09–69–C–0399.

—**Chamberlain Manufacturing Corp.**, Elmhurst, Ill. $7,760,400. Metal parts (M437) for 175mm projectiles. Scranton Army Ammunition Plant, Scranton, Pa. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA–AA09–69–C–0225.

—**U.S. Steel Corp.**, Pittsburgh, Pa. $7,515,500. Metal parts (M106) for 8-inch projectiles. Berwick, Pa., Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA–AA09–69–C–0226.

30—**White Motor Corp.**, Lansing, Mich. $2,407,942 (contract modification). Engineering services for 2½-ton trucks (M–44 and M–600 series). Army Tank Automotive Center, Warren, Mich. DA–AE07–67–C–5674.

—**Pace Corp.**, Memphis, Tenn. $1,562,639. White Star illuminating signals (M127A1). Camden, Ark., and Memphis. Picatinny Arsenal, Dover, N.J. DA–AA21–69–C–0519.

—**Bulova Watch Co.**, Flushing, N.Y. $3,567,629. Mechanical time fuzes for mortar and artillery rounds. Woodside, N.Y. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA–AA09–69–C–0242.

—**Raytheon Co.**, Norwood, Mass. $1,756,327. Telephone signal convertors, CV–1548–A/G. North Dighton, Mass. Army Procurement Agency, New York, N.Y. DA–AB05–69–C–1011.

—**Philco Ford Corp.**, Newport Beach, Calif. $1,346,505. Chaparral simulator evaluators (advanced development program). Army Missile Command, Huntsville, Ala. DA–AH01–69–C–1571.

—**A. O. Smith Corp.**, Chicago, Ill. $8,493,300. Metal parts for 750-pound bombs. M.K.T. Railroad Shop, Bellmead, Tex., American Steel Pipe Co., Birmingham, Ala., and other subcontractors (31%). Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA–AA09–69–C–0398.

—**Connecticut Cartridge Corp.**, Plainville, Conn. $2,832,345. 20mm brass cartridge cases (M103). Frankford Arsenal, Philadelphia, Pa. DA–AA25–69–C–0512.

—**Firestone Tire and Rubber Co.**, Akron, Ohio. $3,590,266. Support services, and loading, assembling and packing 155mm projectiles and related ammunition components. Ravenna, Ohio, Ammunition Plant. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA–11–173–AMC–65(A).

DEPARTMENT OF THE NAVY

1—**TRW, Inc.**, Redondo Beach, Calif. $2,388,400. Design, development, documentation and manufacture of engineering models and prototypes for target designator systems. Naval Purchasing Office, Los Angeles, Calif. N00123–69–C–0503.

—**Leland Stanford Jr., University**, Stanford, Calif. $1,290,000. Research work. Office of Naval Research, Washington, D.C.

—**Robert L. Wilson, Inc.**, Oakland, Calif. $1,383,100. Construction of barracks at the Naval Hospital, Oakland, Calif. Naval Facilities Engineering Command, through Western Division, San Bruno, Calif. N62474–67–C–0731.

3—**United Aircraft Corp.**, East Hartford, Conn. $34,600,000. Production support engineering services for TF30, J–34, J–48, J–52 and J–57/JT3 series aircraft engines. Naval Air Systems Command, Washington, D.C. N00019–69–C–0367.

—**Garrett Corp.**, Phoenix, Ariz. $3,500,000. T76–G–10/12 engines for OV–10 aircraft for the Marine Corps and Air Force. Naval Air Systems Command, Washington, D.C. N00019–69–C–0404.

—**Burnett Construction Co.**, Corpus Christi, Tex. $1,713,300. Aircraft paint shop construction, Corpus Christi Naval Air Station. Naval Facilities Engineering Command, through Gulf Division, New Orleans, La. N62468–69–C–0031.

—**Astrophysics Research Corp.**, Los Angeles, Calif. $1,477,927. Research and investigative studies on the problems of Very Low Frequence systems. Navy Purchasing Office, Los Angeles, Calif. N00123–69–C–0997.

—**Raytheon Co.**, Lowell, Mass. $1,489,904 (contract modification). Guidance and control groups for Chaparral missile. Naval Air Systems Command, Washington, D.C. N0019–69–C–0200.

—**Northwest Construction Co.**, San Francisco, Calif. $1,014,214. Construction of barracks at the Naval Air Station, Moffett Field, Calif. Naval Facilities Engineering Command, through Western Division, San Bruno, Calif. N62474–68–C–0135.

4—**Grumman Aircraft Engineering Corp.**, Bethpage, L.I., N.Y. $9,890,000 (contract modification). E–2C aircraft. Naval Air Systems Command, Washington, D.C. N00019–68–C–0542.

—**General Dynamics Corp.**, Pomona, Calif. $3,290,000. Engineering services to investigate performance of Tartar/Terrier and Standard missiles as demonstrated by fleet firings. Naval Ordnance Systems Command, Washington, D.C. N00017–69–C–2209.

7—**Westinghouse Electric Corp.**, Pittsburgh, Pa. $21,477,099. Designing and furnishing of nuclear propulsion components. Naval Ship Systems Command, Washington, D.C. N00024–67–C–5058.

8—**Sunstrand Corp.**, Rockford, Ill. $3,246,329 (contract modification). Constant speed drives and frequency control boxes for FY 1969 F–4 program for Navy and Air Force. Naval Air Systems Command, Washington, D.C. N00019–68–C–0083.

—**Norfolk Shipbuilding and Dry Dock Corp.**, Norfolk, Va. $1,749,876. Dry docking and regular topside overhaul of amphibious transport dock USS Raleigh (LPD 1). Supervisor of Shipbuilding, Conversion and Repair, Fifth Naval District. IFB N62678–69–B–106.

—**Burrows Corp.**, Detroit, Mich. $1,350,000. Cathode ray tube displays and related modules used in remote and central-user terminals of Message Processing and Distribution System. Paoli, Pa. Navy Purchasing Office, Los Angeles, Calif. N00123–69–C–0298.

—**Consolidated Diesel Electric Co.**, Old Greenwich, Conn. $2,556,052. Production of diesel engine generator sets of various capacities. Old Greenwich, Conn., and Stockton, Calif. Headquarters, Marine Corps, Washington, D.C. M00027–69–C–0125.

9—**United Aircraft Corp.**, East Hartford, Conn. $30,181,198 (contract modification). Procurement of TF30–P–12 and TF30–P–3 engines for the Air Force. Naval Air Systems Command, Washington, D.C. N00019–67–C–0332.

—**Norris Industries**, Vernon, Calif. $1,758,472. Sidewinder missile motor tubes. Naval Ordnance Station, Indian Head, Md. N00174–69–C–0551.

10—**ITT Gilfillan Inc.**, Los Angeles, Calif. $16,000,000 (contract modification). AN/TPS/32 radar for primary tactical air control. Naval Electronic Systems Command, Washington, D.C. NOBSR 95136.

—**Singer-General Precision Inc.**, Silver Spring, Md. $3,500,000. Synthetic flight training system for helicopter pilot instrument flight training at the U.S. Army Aviation School, Fort Rucker, Ala. Naval Training Device Center, Orlando, Fla. N61339–69–C–0200.

—**PRD Electronics, Inc.**, Jerico, L.I., N.Y. $1,868,373 (contract modification). Fabrication and testing of Versatile Avionics Shop Test systems. Westbury, L.I., N.Y. Naval Air Systems Command, Washington, D.C. N00019–67–C–0484.

—**Lockheed Missile and Space Co.**, Sunnyvale, Calif. $1,490,521. Engineering and field engineering support for the Polaris program. Navy Strategic Systems Project Office, Washington, D.C. N00030–69–C–0196.

11—**LTV Aerospace Corp.**, Dallas, Tex. $6,000,000. Development of interface between A–7 aircraft avionics and Versatile Avionics Shop Test systems. Naval Air Systems Command, Washington, D.C. N00019–69–C–0536.

—**General Electric Co.**, Utica, N.Y. $5,310,000. AN/AXR–13 night classification systems. Naval Air Systems Command, Washington, D.C. N00019–69–C–0426.

—**General Dynamics Corp.**, Pomona, Calif. $1,441,210 (contract modification). Standard ARM missiles. Naval Air Systems Command, Washington, D.C. N00019–68–C–0074.

—**Philco-Ford Corp.**, Palo Alto, Calif. $2,453,436. Manufacture of one pre-production model for Alternate Tactical Air Command Control for Phase I of the Marine Tactical Data System. Naval Electronic Systems Command, Washington, D.C. N00039–69–C–3530.

—**H. W. Stanfield Construction Corp.**, and S. L. Haehn Inc., San Diego, Calif. $1,597,332. Construction of recruit barracks

at the Marine Corps Recruit Depot, San Diego, Calif. Naval Facilities Engineering Command, through Southwest Division, San Diego, Calif. N62473-68-C-0123.

—**H. B. Zachery Co.**, San Antonio, Tex. $1,067,000. Repair of runways and simulated carrier deck lighting and markings at Naval Air Station, Kingsville, Tex. Naval Facilities Engineering Command, through Gulf Division, New Orleans, La. N62468-69-C-0056.

14—**Newport News Shipbuilding and Dry Dock Co.**, Newport News, Va. $1,330,000. Topside overhaul of the amphibious assault ship USS Boxer (LPH 4). Supervisor of Shipbuilding, Conversion and Repair, Fifth Naval District. RFP N62678-69-R-164.

15—**Radio Corporation of America**, Moorestown, N.J. $1,071,384. AN/UPS-1C radars. Naval Electronic Systems Command, Washington, D.C. N00039-69-C-3528.

16—**Marinette Marine Corp.**, Marinette, Wis. $10,465,438. Eight repair, berthing and messing barges (YRBMs). Naval Ship Systems Command, Washington, D.C. N00024-69-C-0299.

17—**Leon H. Perlin Co., Inc.**, Newport News, Va. $1,710,000. Construction of a bachelor officers quarters with mess facilities, Naval Amphibious Base, Little Creek, Va. Naval Facilities Engineering Command. N62470-69-C-0793.

—**McDonnell Douglas Corp.**, St. Louis, Mo. $5,250,000 (contract modification). Long lead time effort for RF-4E aircraft for the Air Force. N00019-68-C-0495. $3,044,000 (contract modification). Parts and equipment for A-4M and TA-4J aircraft. Long Beach, Calif., and St. Louis. N00019-67-C-0170. Both awarded by Naval Air Systems Command, Washington, D.C.

—**Northrop Corp.**, Newbury Park, Calif. $5,570,639. MQM-74A target drones. Naval Air Systems Command, Washington, D.C. N00019-69-C-0306.

—**Sanders Associates, Inc.**, Nashua, N.H. $5,000,000 (contract modification). Airborne receiver/transmitters and associated equipment. Naval Air Systems Command, Washington, D.C. N00019-68-C-0630.

—**Garrett Corp.**, Phoenix, Ariz. $1,258,425. GTCP-100-54 gas turbine engines with metal shipping containers. Naval Air Systems Command, Washington, D.C. N00019-69-C-0535.

—**Curtiss-Wright Corp.**, Wood-Ridge, N.J. $1,123,675. Product support engineering services for J65 series engines. Naval Air Systems Command, Washington, D.C. N00019-69-C-0372

21—**Basic Construction Co.**, Newport News, Va. $2,216,950. Construction of barracks at the Naval Amphibious Base, Little Creek, Norfolk, Va. Naval Facilities Engineering Command, through Atlantic Division, Norfolk, Va. N62470-69-C-0737.

—**Sperry Rand Corp.**, Syosset, N.Y. $1,599,000. Engineering services for Ships Inertial Navigation Subsystems during Poseiden conversion of USS James Madison (SSBN 627), US Daniel Boone (SSBN 629) and USS Von Steuben (SSBN 632). Newport News, Va. and Groton, Conn. Naval Ship Systems Command, Washington, D.C. N00024-69-C-5374.

—**Woerfel Corp.**, Milwaukee, Wis. $1,089,300. Construction of ground support equipment shop, automotive maintenance shop, supplies and equipment warehouse, squadron operations building, line fire station and heating plant. Gen. Mitchell Air National Guard Base, Wis. Naval Facilities Engineering Command, through Midwest Division, Great Lakes, Ill. N62465-68-C-0362.

22—**Lockheed Aircraft Corp.**, Burbank, Calif. $4,290,000. P3C systems effectiveness studies. Naval Air Systems Command, Washington, D.C. N00019-69-C-0111.

—**RCA**, Burlington, Mass. $1,800,000. Magnetic airborne detection feature recognition signal processors. Burlington, Mass., and Camden, N.J. Naval Air Development Center, Johnsville, Pa. N62269-69-C-0064.

—**Cutler Hammer**, Deerpark, L.I., N.Y. $1,750,000. Airborne electrical counter measure set components for RA-5C aircraft. Naval Aviation Supply Office, Philadelphia, Pa. N00383-69-C-2061.

—**Electronic Communications, Inc.**, St. Petersburg, Fla. $1,677,128. Radio sets and multicouplers for shipboard use. Naval Ship System Command, Washington, D.C. N00024-69-C-1264.

—**North American Rockwell, Inc.**, McGregor, Tex. $1,297,413 (contract modification). Rocket motors for the Navy and Air Force. Naval Air Systems Command, Washington, D.C. N00019-69-C-0215.

—**General Electric Co.**, West Lynn, Mass. $1,154,000. Maintenance of T64-GE6 aircraft engines. Naval Aviation Supply Office Philadelphia, Pa. F34601-69-A-1028-GB27.

23—**Riha Construction Co.**, La Mesa, Calif. $4,138,910. Construction of a communications electronics school at the Marine Corps Air Station, Twentynine Palms, Calif. Naval Facilities Engineering Command, through Southwest Division, San Diego, Calif. N62473-67-C-3049.

—**Metropolitan Construction Co. of Missouri**, Encino, Mo. $1,635,900. Construction of Marine Corps Exchange at the Marine Corps Air Station, El Toro, Calif. Naval Facilities Engineering Command, through Southwest Division, San Diego, Calif. N62473-68-C-0171.

—**Vitro Corp. of America**, Silver Spring, Md. $1,587,800. Technical assistance, equipment design, installation services, technical data test procedures and ship alteration control for guided missile surface ship weapons systems. Naval Ship Systems Command, Washington, D.C. N00024-69-C-0292.

24—**Borg Warner**, Santa Ana, Calif. $1,295,471. Recorder reproducer and provisioning documentation and services. Naval Avionics Facility, Indianapolis, Ind. N00163-69-C-0508.

—**General Time**, Peru, Ill. $1,128,627. MK 188 Zuni rocket fuzes. Naval Ship Parts Control Center Mechanicsburg, Pa. N00104-69-C-0277.

25—**FMC Corp.**, Minneapolis, Minn. $3,000,000. Fabricate, assemble, test and deliver a Mk 26 Mod 2 guided missile launching system, and a Mk 26 Mod 0 prototype. Fridley, Minn. Naval Ordnance Systems Command, Washington, D.C. N00017-68-C-2109.

—**Sperry Rand Corp.**, Great Neck, N.Y. $1,000,000. Modernization program for Mk 76 Terrier guided missile fire control system, Naval Ordnance Systems Command, Washington, D.C. N00017-69-C-2325.

—**Red-Samm Mining Co.**, Inc., Bellevue, Wash. $1,776,000. Construction of a storm sewer separation at the Naval Shipyard, Bremerton, Wash. Naval Facilities Engineering Command, through Northwest Division, Seattle, Wash. N62476-69-C-0033.

28—**Honeywell, Inc.**, Minneapolis, Minn. $1,664,439 (contract modification). Altimeter sets and associated equipment. Naval Air Systems Command, Washington, D.C. N00019-69-C-0388.

29—**Johns Hopkins University**, Silver Springs, Md. $4,790,342. Advance research on surface missile systems. Naval Ordnance Systems Command, Washington, D.C. N0w-62-0604-C.

—**General Electric Co.**, Pittsfield, Mass. $3,616,000. Production of Mark 73 Mod 2 director systems and ancillary equipment for Tartar missiles. Naval Ordnance Systems Command, Washington, D.C. N00017-69-C-2408.

—**Fine and Salzberg, Inc.**, Norfolk, Va. $2,229,473. Construction of barracks at the Naval Amphibious Base, Little Creek, Norfolk, Va. Naval Facilities Engineering Command, Washington, D.C. N62470-69-C-0737.

—**Packard Bell Corp.**, Newbury Park, Calif. $1,856,750. Manufacture of AN/UPM-137 radar sets and associated parts. Naval Electronic Systems Command, Washington, D.C. N0039-68-C-2585.

30—**G. L. Cory, Inc.**, San Diego, Calif. $1,816,768. Construction of an aircraft maintenance and test hangar for the Joint Parachute Test Facility, Naval Air Facility, El Centro, Calif. Naval Facilities Engineering Command, through Southwest Division, San Diego, Calif. N62473-68-C-0132.

DEPARTMENT OF THE AIR FORCE

1—**Boeing Co.**, Seattle, Wash. $1,400,000. Installation and test support for the Hard Rock Silo Development Program. Space and Missile Systems Organization, AFSC, Los Angeles, Calif. F04701-69-C-0186.

—**Boeing Co.**, Wichita, Kan. $1,045,104. Depot level modifications on B-52s. Oklahoma City Air Materiel Area, AFLC, Tinker AFB, Okla. F34601-68-C-4653 P007.

—**Radio Corporation of America**, Burlington, Mass. $1,500,000. Development of a microelectronic noise jammer. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33615-69-C-1488.

—**Collins Radio Company**, Cedar Rapids, Iowa. $18,100,000. Aircraft Flight Director Systems for C-135 aircraft. Oklahoma City Air Materiel Area, AFLC, Tinker AFB, Okla. F34601-69-C-2462.

—**Itek Corp.**, Palo Alto, Calif. $6,095,000. Production of radar sets for F-4E aircraft. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33657-68-C-1302-PZ08.

—**Western Electric Co.**, New York, N.Y. $1,905,471. Engineering services for the 490L Overseas Autovon Program. Electronics Systems Division, AFSC, L. G. Hanscom Field, Mass. F19628-69-C-0170.

—**Hallicrafters Co.**, Rolling Meadows, Ill. $1,333,328. Production of countermeasure equipment. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33657-69-C-1024.

—**Olin Mathieson Chemical Corp.**, Stanford, Conn. $1,033,442. Production of missile propellant and operation of Air Force Plant #80, Saltville, Va. San Antonio Air Materiel Area, AFLC, Kelly AFB, Texas. F41608-69-C-0002.

4—**Lear Siegler, Inc.**, Grand Rapids, Mich. $3,061,492. Production of AJB/ASN-55 airborne computer components. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33657-68-C-0296-P013.

7—**Lockheed Aircraft Corp.**, Marietta, Ga. $8,000,000. HC-130N aircraft and related equipment. Aeronautical Systems Divis on, AFSC, Wright-Patterson AFB, Ohio. F33657-69-C-0004.

—**Bendix Corp.**, Teterboro, N.J. $2,108,407. Production of airborne navigation equipment. Aeronautical Systems Div., AFSC, Wright-Patterson AFB, Ohio. F33657-69-C-1028.

—**Avco Corp.**, Stratford, Conn. $4,235,366. Production of ballistic missile penetration aids. Space and Missile Systems Organization, AFSC, Los Angeles, Calif. F04701-68-C-0039.

8—**Lockheed Aircraft Corp.**, Marietta, Ga. $7,704,218 (contract modification). Engineering, design, fabrication and installation of modified wing for C-130 B/E aircraft. Warner Robins Air Materiel Area, AFLC, Robins AFB, Ga. F09603-68-C-2530.

—**Litton Systems Inc.**, Van Nuys, Calif. $1,606,014. Manufacture of ground radar components. Sacramento Air Materiel Area, AFLC, McClellan AFB, Calif. F04606-69-A-0193.

9—**Conductron Corp.**, St. Charles, Mo. $18,446,400. Production of a weapon system training simulator and related ground equipment for A-7D aircraft. Aeronautical System Division, AFSC, Wright-Patterson AFB, Ohio. F33657-69-C-0628.

—**Loral Corp.**, Bronx, N.Y. $3,886,810. Production of airborne countermeasure systems for RF-4C aircraft. Warner Robins Air Materiel Area, AFLC, Robins AFB, Ga. F33657-68-A-0098.

—**Litton Systems, Inc.**, Woodland Hills, Calif. $2,840,750. Gyroscopes applicable to F-4 aircraft inertial guidance system. Oklahoma City Air Materiel Area, AFLC, Tinker AFB, Okla. F04606-68-A-0147.

—**Marwais Steel Co.**, Richmond, Calif. $2,570,993. Production of aircraft shelters. 2750th Air Base Wing, Wright-Patterson AFB, Ohio. F33600-69-C-0380.

—**Boeing Co.**, Seattle, Wash. $1,197,440. Production of modification kits for the Bomarc instrumentation and range safety system. Ogden Air Materiel Area, AFLC, Hill AFB, Utah. F04606-68-A-0148.

10—**Hallicrafters Co.**, Rolling Meadows, Ill. $1,538,800. Production of airborne countercomponents applicable to B-52 aircraft. Chicago, Ill. Warner Robins Air Materiel Area, AFLC, Robins AFB, Ga. F09603-69-C-2927.

—**Avco Corp.**, Cincinnati, Ohio. $1,578,766. Production of electron tubes for ground radar sets. Sacramento Air Materiel Area,

AFLC, McClellan AFB, Calif. F34601-68-A-4451.

11—**Chromaloy American Corp.**, San Antonio, Tex. $1,704,732. Repair and application of protective metallic coating on J-57 and J-75 compressor blades. San Antonio Air Materiel Area, AFLC, Kelly AFB, Tex. F41608-68-D-1617.

14—**Batesville Manufacturing Co.**, Batesville, Ark. $4,831,200. Production of bomb components. Armament Development and Test Center, AFSC, Eglin AFB, Florida. F33657-68-C-0164.

15—**Bob Rutherford Construction Co.** Albuquerque, N.M. $1,500,000. Engineering, design and construction of a high explosive simulation test facility near Cedar City, Utah. Air Force Special Weapons Test Center, Kirtland AFB, N.M. F29601-69-C-0097.

—**United Aircraft Corp.**, Hartford, Conn. $1,032,030. Production of component parts applicable to J-57 aircraft engines. San Antonio Air Materiel Area, AFLC, Kelly AFB, Tex. N383-69000A.

—**McDonnell Douglas Corp.**, St. Louis, Mo. $4,420,000. Modification of F-4 series aircraft. Robertson, Mo. Ogden Air Materiel Area, AFLC, Hill AFB, Utah. F34601-68-A-2919.

—**General Electric Co.**, West Lynn, Mass. $1,000,000. Design, development, fabrication and acquisition of long lead time items of special tooling for turbojet and turbo-prop engines. Aeronautical Systems Division, AFSC. Wright-Patterson AFB, Ohio. F33657-69-C-1026.

16—**Chromalloy American Corp.**, New York, N.Y. $1,735,571. Repair and coating of J57 and TF33 engine guide vanes. West Nyak, N.Y. San Antonio Air Materiel Area, AFLC, Kelly AFB, Tex. F34601-68-A-2991-SA02.

—**McDonnell Douglas Corp.**, Long Beach, Calif. $13,500,000. Supplies and services for contract definition of an Airborne Warning and Control System. Electronic Systems Division, AFSC, L. G. Hanscom Field, Mass F19628-69-C-0195.

—**Boeing Co.**, Seattle, Wash. $17,500,000. Supplies and services for contract definition of an Airborne Warning and Control System. Electronic Systems Division, AFSC, L. G. Hanscom Field, Mass. F1928-69-C-0194.

17—**General Motors Corp.**, Indianapolis, Ind. $5,018,240. Production of turboprop aircraft engines and power sections. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33657-69-C-0357.

18—**Adams-Russell Co.**, Waltham, Mass. $1,003,808. Production of antennas for various aircraft. Warner Robins Air Materiel Area, AFLC, Robins AFB, Ga. F33657-69-A-0015-RJ02.

—**United Aircraft Corp.**, Windsor Locks, Conn. $1,200,000. Research to obtain propellor and cyclic control technology. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33615-69-C-1720.

—**McDonnell Douglas Corp.**, St. Louis, Mo. $1,222,500. Prototype installation and flight testing of target identification system for F-4E aircraft. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33657-69-C-0988.

23—**Marwais Steel Co.**, Richmond, Calif. $1,250,009. Production of aircraft shelters. 2750th Air Base Wing, Wright-Patterson AFB, Ohio. F33600-69-C-0380.

—**OMI Corp. of America**, Alexandria, Va. $1,833,497. Procurement of analytical photogrammetric steropolotters used for making maps. Southfield, Mich., and Rome N.Y. Rome Air Development Command, AFSC, Griffis AFB, N.Y. F30602-69-C-0301.

24—**McDonnell Douglas Corp.**, Tulsa, Okla. $1,814,852. Modification and repair of B-66 series aircraft. Warner Robins Air Materiel Area, AFLC, Robins AFB, Ga. F09603-69-C-3817.

—**Northrop Corp.**, Palos Verdes Peninsula, Calif. $1,332,000. Modification kits for target identification equipment. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33657-69-C-0979.

29—**Crescent Precision Products, Inc.**, Garland, Tex: $3,670,021. Fin assemblies and related data for 750-pound bombs. Ogden Air Materiel Area, AFLC, Hill AFB, Utah. F42600-69-C-3132.

30—**McDonnell Douglas Corp.**, Huntington Beach, Calif. $1,300,000. Advanced development of multiple solid fuel boosters for Thor launch vehicles. Santa Monica, Calif. Space and Missile Systems Command, AFSC, Los Angeles, Calif. F04701-69-C-0340.

—**General Motors Corp.** Indianapolis, Ind. $40,000,000. Supplies applicable to T-56 turboprop aircraft engines. Oklahoma City Air Materiel Area, AFLC, Tinker AFB, Okla. F34601-69-C-0734.

—**Boeing Co.**, Seattle, Wa. $2,004,083. Combat trainer launch instrumentation applicable to the Minuteman weapon system. Ogden Air Materiel Area, AFLC, Hill AFB, Utah. F04606-69-A-0171-QP10AA.

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DCAS Engineering To Be Reorganized

Reorganization of the engineering elements in the Defense Contract Administration Services (DCAS) at Headquarters, Defense Supply Agency, has been announced by Rear Admiral Joseph L. Howard, SC, USN, Director for DCAS.

A working group headed by the management engineering segment of the DCAS headquarters was assigned the responsibility of drawing up a plan for realignment of the organization structure of the more than 600 engineers in headquarters and 99 regional, district and defense contractor plant offices of DCAS.

Essentially, the reorganization provides a separation of engineering elements from other professional operations in contract administration. The seperation will provide DCAS engineering with an identity not previously recognizable, making it possible for military customers to deal directly with professional engineers in solving engineering problems.

Under the new proposal, the systems support engineers will become a separate engineering entity, reporting directly to the commander of the DCAS activity to which they are assigned.

The purpose of the proposed realignment is to focus engineering liaison services more directly on complex weapon systems for the benefit of the military buyer, the civilian producer, and the overall Defense Department administration of the contracts. This, it is hoped, will provide a sharply defined central point for the coordination of engineering policy for the benefit of all elements concerned with the production of defense supplies.

Additional advantages expected are fuller utilization of the diverse engineering resources within DCAS, the provision of regular channels for professional development and advancement, and a system that will more readily attract young professional engineers.

Normal production engineering and quality engineering performed in support of the Production and Quality Directorates will remain essentialy unchanged.

From The Speaker's Rostrum

(*Continued from Page 30*)

Future Trends

In conclusion, I want to respond as best I may to a request for comment on policy changes involving Foreign Military Sales and also to touch on some trends I discern in contemplating the future of both FMS and MAP. The new Administration is, of course, reviewing each of these undertakings; but no substantive policy changes have been announced. Meanwhile, several studies on these subjects are under way in the National Security Council and elsewhere.

As to future trends, I believe:

- Grant aid will probably remain at its present level in FY 1970, but will gradually decline thereafter.
- Sales to highly developed countries will probably decline as those countries strive to produce their own military equipments. They have already dropped from 97 percent of the total in FY 1962 to 68 percent last year.
- Sales to "oil rich" and less developed countries will probably increase.
- Technical components and "know-how" are likely to represent a maior portion of sales to highly developed countries.
- Complete end items and systems will probably make up sales to "oil rich" and less developed countries—with increased emphasis on co-production.

Whatever lies ahead for the Military Assistance Program and Foreign Military Sales, I look forward to working closely with many of you in the future. I will welcome your assistance and cooperation in our activities and will appreciate any ideas, recommendations, criticisms (contructive or otherwise) you may care to volunteer as we move together into that future.

Computer Management Activity Established by Army CDC

U.S. Army Combat Developments Command (CDC), Fort Belvoir, Va., has established a new headquarters directorate to manage all types of computer activities related to developmental efforts at CDC.

The new element has been designated as the command's Automatic Data Processing/Management Information Systems Directorate (ADP/MIS) and is headed by Colonel Charles T. Caprino. In addition, former Deputy Comptroller/Deputy Director of Data Processing and Programs, Colonel Joseph E. Halloran Jr., has been appointed Comptroller/Program Coordinator for CDC. This office is a redesignation of the Comptroller/Director of Data Processing and Programs resulting from creation of the new ADP/MIS directorate.

Mission of the ADP/MIS Directorate is to oversee all computer activities of CDC's developmental program including Automatic Data Systems for the Army in the Field (ADSAF), management information systems, tables of organization and equipment, experimentation and testing, scientific modeling, and the instrumentation of computer technology.

ADP/MIS will assume responsibility for automatic data processing development programs handled by the Automatic Data Field Systems Command, which changed status in April to that of Computer Systems Command.

Army Seeking Fire-Fighting Helos

"Light water" and light helicopters are the basis of a new aircraft fire fighting system proposed by the Army's Medical Service Agency, Fort Sam Houston, Tex., a part of the Combat Developments Command.

"Light water" is a prefluorinated chemical solution which enables water to smother petroleum fires. In preliminary tests it has proven promising, the Army said.

The system, to be used in controlling aircraft fires during personnel rescue operations, consists of a light helicopter equipped with "light water" spray apparatus. The Army estimates that 25 gallons of "light water" sprayed from a telescoping or retractable boom could open a 20 by 40 foot path for three minutes for rescuers.

The Army calls for the spray equipment to weigh less than 500 pounds and to be mounted either externally or internally.

Air Force Forecasts 1969 Computer Needs

A tentative forecast of 11 computer equipment selections was issued by the Electronic Systems Division (ESD), Air Force Systems Command. The forecast is subject to change, according to ESD, and is issued for industry planning only.

Forecasts for requests for proposals for the second quarter of calendar year 1969 included: Headquarters, Office of Aerospace Research, selection of a computer; World-Wide Military Command and Control System, selection of data processing equipment for various elements; Air Force Logistics Command, replacement of nine computers; Seventh Aerospace Defense Command, Air Division Headquarters, replacement of Delayed Line Output SAGE equipment.

Third and fourth quarter forecasts include: Eastern/Western Test Ranges, replacement of 11 computers; Strategic Air Command, Replacement Project, replacement of six computers and part or all of three other systems; replacement of computers at the Air Force Academy, Air Force Rocket Propulsion Laboratory, Air Force Flight Test Center, Air Force Logistics Command Micromation and Air Force Logistics Command, Newark Air Force Station.

Interested companies should contact the Electronic Data Processing Equipment Office, ESD, L.G. Hanscom Field, Mass. 01730.

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Official Business

New Terminal Equipment for AUTODIN Is in Advanced Test Phase

Electronic equipment, designed to eliminate separate teletype and data card terminal operations within the Defense Department's world-wide Automatic Digital Network (AUTODIN), is in advanced testing by personnel of the Air Force Communications Service headquartered at Scott AFB, Ill.

The equipment, designated Digital Subscriber Terminal Equipment (DSTE), will replace a variety of manual and semi-automatic terminal equipment now maintained and operated on an industrial contract basis. Most of the contracts will be terminated as the government-owned DSTE installations are completed.

The AUTODIN network is the world's largest digital communication system, providing DOD with high-speed transmission of information from punch card, paper tape, magnetic tape, or page copy form. Messages fed into the DSTE facilities will be processed, routed and transmitted automatically by AUTODIN.

Each DSTE site will be customized to meet the needs of the installation it serves. Component parts, such as the control unit, punch card and tape message keyboards, card readers, tape readers and page printers, can be combined in six different configurations to satisfy requirements. Message capacities range from 200 words per minute for the smallest terminal to 1,500 words per minute, plus 100 punch cards per minute, for the largest.

With the installation of the new system, the AUTODIN will be capable of faster communications with a larger message handling capacity, greater reliability and lower cost.

The tests, being conducted at Shephard AFB, Tex., with one of the initial production models, are providing the Air Force Communication Service (AFCS) realistic practice in maintaining and operating the system. AFCS personnel will eventually be responsible for about 600 of the DSTE installations. Army, Navy and other Air Force commands will operate an additional 440 units.

Delivery of the first DSTE units is expected about mid-1969, for use at overseas bases and installations. U.S. bases and stations expect delivery of the DSTE system sometime in mid-1970.

DESC Assumes DOD Management of Integrated Circuits

The Defense Electronics Supply Center (DESC), Dayton, Ohio, has been assigned management responsibility for microelectronic circuit devices employed by the military and various Federal agencies.

The microelectronic circuits, also known as integrated circuits, are the 17th supply class assigned to DESC management. Identified within the defense logistics system as Federal Supply Class FSC 5962, they encompass approximately 1,950 Federal stock numbers managed by various DOD activities.

Officials foresee widespread future use for the integrated circuits. They are currently being designed into new electronic devices for the military, and industry expects military applications to account for one-half of the integrated circuit sales by 1970.

DESC now has complete logistic responsibility for FSC 5962. Prior to this, DESC was designated the Defense Department standardization activity for the class, which included coordination of specifications among the Services to avoid part duplications.

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